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ABSTRACT

The U.S. Congress passed the Arctic Research and Policy Act in 1984 and designated the National Science Foundation (NSF) the lead agency in implementing arctic research policy. In 1989, the parameters of arctic social science research were outlined, emphasizing three themes: human-environment interactions, community viability, and rapid social change. This booklet reports on a 1997 workshop in which participants reviewed the progress made in the first 7 years and identified opportunities and needs in arctic social science research. Chapter 1 explains the context and the unique opportunities the Arctic offers to social science researchers. Chapter 2 describes five current research themes: culture and environment, resources and economic change, development of social and political institutions, ethnic and regional identities, and indigenous knowledge systems. Chapter 3 discusses working in the Arctic. NSF encourages interdisciplinary research that blends qualitative and quantitative research into collaborative projects involving partnerships among scientists, indigenous peoples, and local organizations. Research should be relevant to local needs and contribute to education programs in and outside arctic communities. Chapters 4-8 contain 71 references; NSF grant awards in arctic social sciences, 1991-1999; the principles for conduct of research in the Arctic; current arctic research program opportunities and information on submission of proposals; and reviewers, contributors, and workshop participants. (TD)

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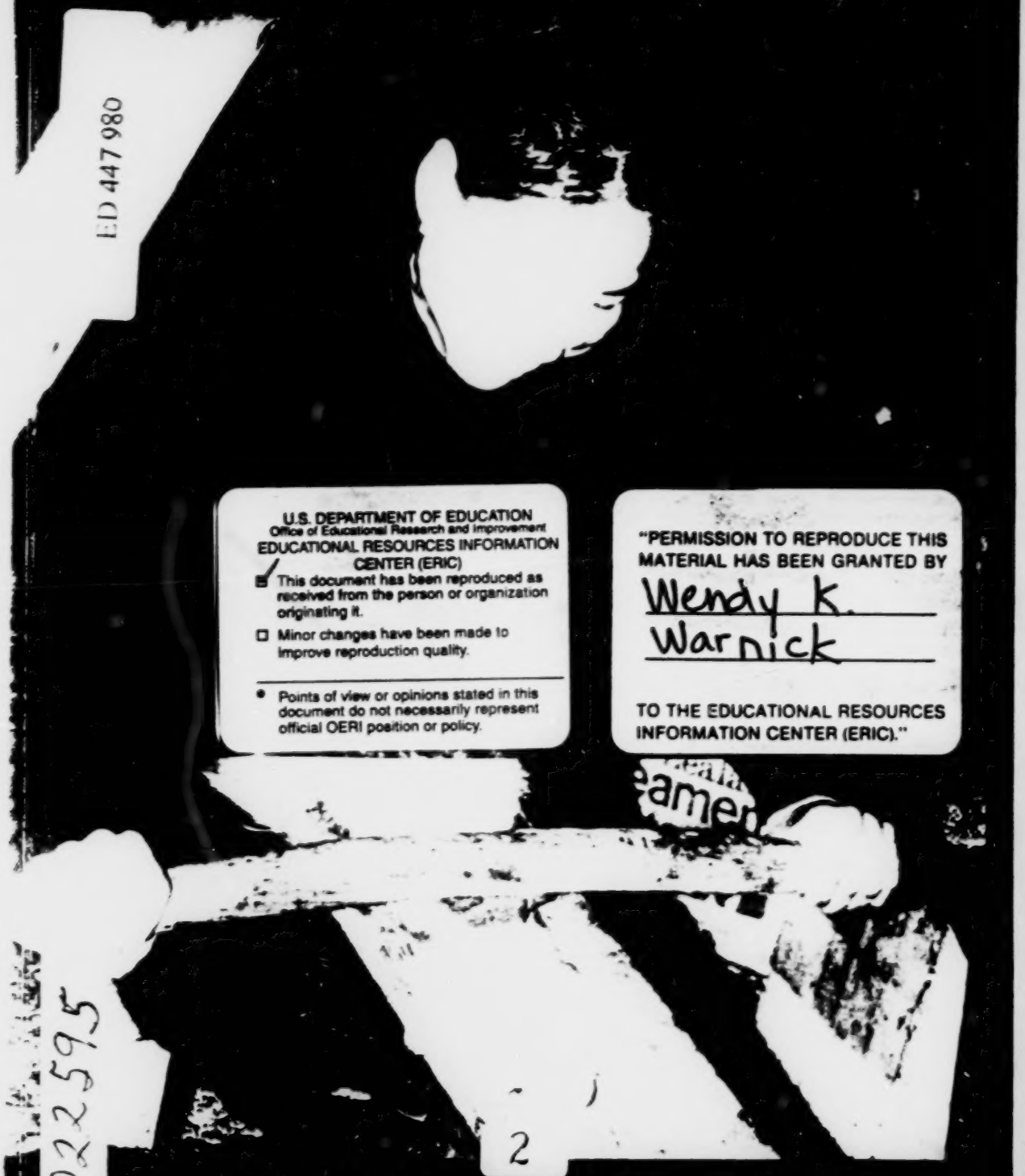
Arctic Social Sciences

Opportunities in Arctic Research

ED 447 980



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RC 022595

For the National Science Foundation
Arctic Social Sciences Program

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Cover: A Chukchi woman scraping a hide at a reindeer herder camp several hours outside of Yanrakynnot, Chukchi Peninsula, Russia, in August 1990 (photograph by Peter Schweitzer).

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rctic Social Sciences

Opportunities in Arctic Research

For the National Science Foundation
Arctic Social Sciences Program

June 1999

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Background photo previous page: The backs of traditional Yup'ik parkas, spectators at a dog race in Bethel, Alaska (© James H. Barker).

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Preface

The National Science Foundation's (NSF) Office of Polar Programs (OPP) offers focused multidisciplinary and interdisciplinary programs that emphasize the uniqueness of the Arctic for scientific studies. Within OPP, the Arctic Social Sciences Program encompasses all social sciences supported by NSF, including anthropology, archaeology, economics, geography, linguistics, political science, psychology, sociology, and related subjects. The program welcomes a variety of approaches, from small, single-investigator proposals and dissertation improvement proposals to larger, multi-institution, multi-investigator projects.

Although unsolicited proposals in any of the social sciences mentioned above are welcome, areas of particular interest include rapid social change, community viability, and human/environment interactions. These areas were outlined in *Arctic Social Science: An Agenda for Action* (1989), a document produced by the Committee on Arctic Social Sciences, Polar Research Board, National Research Council.

The National Science Foundation appreciates the many ideas and suggestions flowing from the research and education communities. The statement of opportunities that follows emerged from an NSF-sponsored workshop of arctic social scientists. In addition, many social scientists and educators

reviewed the initial draft produced after the workshop and provided written comments. For example, reviewers suggested additional areas of research to highlight the unique role of the Arctic in social processes, both past and present.

As the current Arctic Social Sciences Program director, I extend my thanks to all who took the time to contribute to the statement of opportunities. I would also like to mention that NSF offers many cross-cutting opportunities, such as (1) joint review between Arctic Social Sciences and other programs within the Division of Social, Behavioral, and Economic Research; (2) integrative activities between research and education through the various divisions under the Directorate for Education and Human Resources; and (3) joint review and integrative activities with the Arctic System Sciences Program, particularly through the new Human Dimensions of the Arctic System (HARC) initiative. In addition, an informal understanding with the Social Sciences and Humanities Research Council of Canada enables joint review of proposals of common interest and involving researchers from the U.S. and Canada.

The announcement for Arctic Research Program Opportunities, NSF 98-72, describes the Arctic Social Sciences Program and the requirements for proposals. After reading the program announcement and this statement of opportunities, please do not hesitate to call or write NSF with questions or comments.

Thanks again, and best wishes in your future endeavors.

—Fae L. Korsmo
National Science Foundation
Arctic Social Sciences Program Director
June 1999

Foreword

The Arctic provides tremendous opportunities for studying social, cultural, political, ecological, and economic processes over time and across regions. Arctic researchers also have the opportunity and responsibility to work with residents of the region to conduct collaborative and ethical research projects. In 1990, the National Science Foundation (NSF) created the Arctic Social Sciences Program in response to the broad federal agency recommendations made in *Arctic Social Science: An Agenda for Action*, prepared in 1989 by an interdisciplinary committee established by the Polar Research Board. The NSF program, initiated to support arctic social sciences research within the NSF scope, was guided by the three themes articulated in *Agenda for Action:* human-environment interactions, community viability, and rapid social change.

In its first nine years, the program has supported strong and innovative research around the circumpolar North. To help the program continue to do so, NSF and the Arctic Research Consortium of the United States (ARCUS) convened a workshop of arctic social scientists in October 1997 to develop an outline of this statement of opportunities. This statement was drafted and subsequently reviewed by workshop participants and others in the arctic social science community. It is intended to build on the *Agenda for Action*, to stimulate creative thinking

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and interaction about a variety of research areas, and to expand and augment the work done so far under the Arctic Social Sciences Program.

From the participation in the initial workshop to the writing of the sections of this document to the comments we received on drafts, it is clear that arctic social scientists are passionately committed to their work. That the program has become a focal point for such vigor is a tribute both to NSF and to the *Agenda for Action*. I thank all who contributed their ideas and expertise to make the statement stronger, from the participants in the initial workshop to those who commented on the drafts. There simply is not room to include or even attempt a comprehensive summary of the possibilities inherent in arctic social science research, but I hope that readers will find here a useful place to start thinking about the opportunities and responsibilities that lie before us.

I would like to acknowledge the hard work done by the ARCUS staff. The production of this statement would not have been possible without Wendy Warnick's guidance of the planning and editing; Sue Mitchell's, Anne Sudkamp's, and Alison York's editorial, layout, and design skills; and Diane Wallace's copy-editing expertise. On behalf of the arctic social science community, I thank the National Science Foundation for the opportunity to participate in this important process.

—Henry P. Huntington, Workshop Chair
June 1999

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The Context

The NSF Arctic Social Sciences Program

The U.S. Congress passed the Arctic Research and Policy Act (ARPA) in 1984 as a response to national concerns about the need for more and better research on the Arctic. This act established the U.S. Arctic Research Commission (USARC) to promote and make policy recommendations for arctic research, founded an Interagency Arctic Research Policy Committee (IARPC) to develop and plan implementation of a national arctic research policy, and designated the National Science Foundation (NSF) as the lead agency responsible for implementing arctic research policy. As part of this initiative, the Polar Research Board of the National Academy of Sciences formed a Committee on Arctic Social Sciences, which prepared a detailed report and recommendations called *Arctic Social Science: An Agenda for Action* (1989). That document established the parameters of arctic social science research for federal agencies and emphasized three themes: human-environment interactions, community viability, and rapid social change.

As a result of these recommendations, NSF, with the approval of the National Science Board, established the Arctic Social Sciences Program and hired a program director in 1990. The Arctic Social Sciences Program has encouraged and

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supported basic research in the social sciences, including anthropology, archaeology, economics, geography, political science, psychology, sociology, and related fields (see page 43 for awards supported by this program).

The substantial body of work produced by social scientists working in the Arctic has greatly expanded our understanding of human populations in the North, particularly through the prehistory of the Arctic and the lifeways of indigenous peoples. Studies of arctic communities describe the resilience of remote villages, where many residents hope to continue subsistence lifestyles and overcome fragile economies and pressing social needs (Caulfield 1993, 1995, 1997, Chance and Andréeva 1995, Condon *et al.* 1995, Freeman 1993, Hamilton and Seyfrit 1993, Seyfrit *et al.* 1998). Archaeological studies show that similar challenges have confronted arctic settlements for millennia and that past adaptations may forecast some implications of future changes (Amorosi 1992, Amorosi *et al.* 1994, 1997, Buckland *et al.* 1996, Maschner in press, Mason and Gerlach 1995, McGovern *et al.* 1996). Research on human-environment relationships has documented the efficacy of a relatively new approach to managing natural resources, using co-management by both professional managers and traditional users (Collings 1997, Huntington 1998, Huntington *et al.* 1999, Mymrin *et al.* 1999). Work modeling the effects of rapid change in arctic societies over the last century has shown that arctic residents increasingly combine elements of traditional cultures with the educational and employment opportunities that are found both at home and elsewhere (Collings *et al.* 1998, Hamilton and Seyfrit 1994a, 1994b, Hamilton *et al.* 1996, Seyfrit and Hamilton 1992, Seyfrit *et al.* 1998). The Arctic Social Sciences Program also has supported important collaborations and partnerships, including cooperative work among U.S. and international scientists, researchers and indigenous peoples, social and natural scientists, and social scientists and schools (Huntington 1998, Huntington *et al.* 1999, Mymrin *et al.* 1999, Young 1996b).

THIS STATEMENT OF OPPORTUNITIES IS INTENDED TO STIMULATE RIGOROUS AND INNOVATIVE BASIC RESEARCH AND COLLABORATIONS IN ARCTIC SOCIAL SCIENCE.

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In 1997, growing awareness of the need for research to address current political, social, economic, and environmental issues in the Arctic led NSF to sponsor a workshop, coordinated by the Arctic Research Consortium of the United States (ARCUS), to provide a continuing framework for the Arctic Social Sciences Program. The workshop participants reviewed the progress made in the first seven years of the program—identifying significant accomplishments as well as important gaps in understanding—to articulate opportunities and needs in arctic social science research funded by NSF. This statement of opportunities, the result of that workshop, is intended to stimulate rigorous and innovative basic research and collaborations in arctic social science.

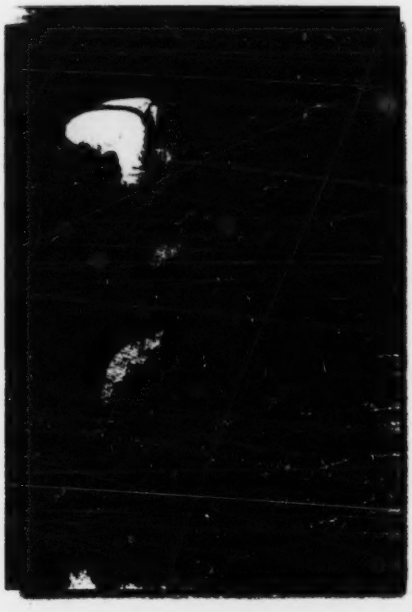
Social Science Research in the Arctic

The Arctic is an exciting place for social science research. The circumpolar North offers opportunities rarely available elsewhere to social scientists, regardless of their discipline or time period of interest. Accessible archaeological sites, oral histories, and historical records offer opportunities to study the past. Cultural, social, economic, and political changes of the present and recent past provide opportunities to study processes, organizations, and policies as they

Machinery from an abandoned marble quarry near King's Bay, Svalbard Archipelago, Norway. The Svalbard Archipelago was colonized to develop mineral resources, but in the 1960s the Norwegian government established a research station at Ny-Ålesund, which had been a major coal-mining community. In other areas of Svalbard, Norwegian and Russian companies still mine coal. In the past, American, British, Dutch, and Swedish coal companies also mined there (photograph by Øivind Tøien).

occur and develop. For example, recent U.S. welfare reforms have implications for the viability of small and remote Alaskan villages. Bans on trade in marine mammal products and moratoria on whaling or fishing, many of which are driven by groups outside the Arctic, impact the economies and cultures of indigenous and nonindigenous peoples in Greenland, Arctic Canada, Norway, Alaska, and the Russian North (Caulfield *et al.* 1994, Freeman 1993, Freeman *et al.* 1998, Hovelsrud-Broda 1997). Changes in world markets for oil, minerals, forest products, and marine resources have far-reaching consequences for local and regional subsistence activities and commercial production (Chance and Andréeva 1995, Seyfrit and Hamilton 1992a, 1992b). New governments are being formed, such as the new territory of Nunavut, which is based on Inuit land claims in northern and eastern Canada and which will govern about 20% of the area of the country beginning in 1999 (Légaré 1996, Nunavut Implementation Commission 1995).

SUBJECTS AND RESEARCHERS OFTEN BECOME LESS DISTINCT AS RESEARCH BECOMES A MORE COLLABORATIVE VENTURE.



Flensing a narwhal in Disko Bay, Greenland. Narwhal, beluga, and other marine mammals are an integral part of mixed subsistence-cash economies in many arctic communities (photograph by Richard A. Caulfield).

The opportunities for social science research in the Arctic differ from traditional research in the social sciences. First, research is conducted based on the *Principles for the Conduct of Research in the Arctic* (see page 55), developed by the Social Science Task Force of the U.S. Interagency Arctic Research Policy Committee (IARPC 1990). These principles include involving northern residents in the planning and conduct of research, where possible. Such inclusion may change the traditional social science relationship between the people being studied and the

people doing the studying—subjects and researchers often become less distinct as research becomes a more collaborative venture (Fehr and Hurst 1996, Fienup-Riordan 1997, Huntington 1998, Huntington *et al.* 1999, Mymrin *et al.* 1999). Second, much of arctic social science research has direct relevance to the well-being of northern residents and can have an immediate impact on their lives.

Wassilie Berlin using a bow at Berlin's Museum für Völkerkunde (photograph by Museum für Völkerkunde, courtesy of Ann Fienup-Riordan).

In addition to its actual and potential applications, arctic social science makes major contributions to the advancement of social science theory, methodology, and the cumulative body of social science knowledge. The ability to have access to many and varied archaeological sites; to study cultural, economic, social, and political processes as they occur; to examine the effects of extreme environments; and to conduct comparative work that covers different nations, different cultures, and different social, economic, and political systems gives researchers studying the arctic opportunities to make significant advances in virtually every area of social science (Chance and Andréeva 1995).

Distinctive Opportunities and Pressing Needs

Arctic social science provides the United States social science research community with distinctive opportunities to increase understanding of the dynamics of past and current social change and to identify and test hypotheses about the impacts of possible near-future changes on social systems. Compared with many other parts of the world, the relatively less

CHALLENGES TO THE SURVIVAL OF DISTINCT CULTURES THROUGHOUT THE ARCTIC NEED TO BE UNDERSTOOD AND ADDRESSED.

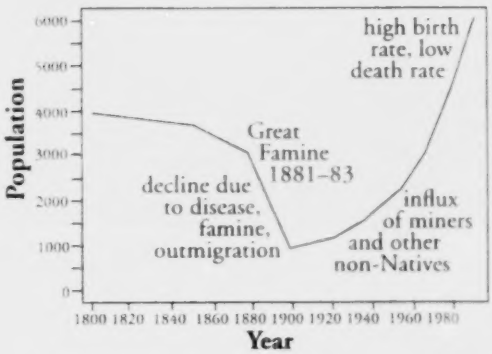
complex social and social-environmental linkages that exist in the Arctic allow for relevant variables to be more easily isolated. In addition, many types of changes that occurred over centuries—or centuries ago—in other regions were compressed into the last few generations in the North. Thus, historical records and oral traditions offer richer documentation of the processes of social change than are available for most other regions (Fienup-Riordan 1997, Schneider 1995, 1996). Archaeological sites in most sectors of the Arctic are also better preserved and more easily found than sites in more temperate areas and are often linked directly to current populations (Maschner in press). This nexus of environmental and historical conditions often allows researchers to discern past processes of social change more clearly in the Arctic than in other areas.

The rapid social change that has characterized arctic communities creates not only distinctive opportunities, but also a pressing need for social science research. Relatively recent shifts from a high level of self-sufficiency among arctic communities to their incorporation into national states and the global economy have challenged cultures that have coped successfully with severe environmental conditions over millennia (Caulfield 1997, Freeman 1993, Korsmo 1996, Marcus 1995, McNabb *et al.* in press, Morrow 1993). Social scientists need to identify responses to social, economic, and environmental change by social systems and seek models for optimizing these

An 18th-century Inuit house at the Uivak Point 1 site, Okak Bay region of Labrador. The whale vertebra has been leveled, possibly for use as a table or support. Uivak, once one of three thriving whale hunting communities in the region, sits abandoned. Today, residents of Labrador visit the region seasonally to hunt waterfowl, caribou, seals, and bears (photograph by Susan A. Kaplan).

responses. Challenges to the survival of distinct cultures throughout the Arctic need to be understood and addressed. The recent opening of Russia to the West offers researchers unprecedented opportunities to work with Russian colleagues and to conduct studies there—and the Russian North has especially pressing needs for research to address social and economic problems (Badger and Balikci 1993, Balikci 1990, Fondahl 1995, 1996a, 1996b, 1998, Krupnik 1991, 1992, 1996, Krupnik and Levenson 1993, McNabb *et al.* in press, Schweitzer 1997, Schweitzer and Golovko 1997).

Population of the Kotzebue Sound District, 1800–1990



Human-environment interactions can affect the populations of resource-dependent societies in a variety of ways, including rapid social change. This figure traces the population history of Alaska's Kotzebue Sound region from 1800 to 1990 (Hamilton et al. *1997).*

Interdisciplinary and Partnership Focus

The NSF Arctic Social Sciences Program embraces a multitude of disciplines, allowing researchers to take the best methodologies from among many social science disciplines and apply them in either individual or team projects in new and important ways. It encourages blending qualitative and quantitative research approaches to address issues of importance to northern residents. Following the *Principles for the Conduct of Research in the Arctic* may require methodological innovations that combine scientific rigor with substantive local involvement. The benefit of involving northern residents is that research questions can be driven by and relevant to cultural, social, economic, and political survival and viability (Fehr and Hurst 1996, Huntington 1998, Schneider 1995).

The Arctic Social Sciences Program has been successful in providing funding for collaborative projects that can be accomplished best by partnerships among scientists, indigenous peoples, and local organizations. Such innovative approaches

to research are consistent with the program's commitment to the NSF strategic plan of developing intellectual capital, strengthening physical infrastructure, integrating research and education, and promoting partnerships. The program encourages projects that:

- enhance the diversity of social science disciplines and researchers supported by the program, including increased participation by new investigators and indigenous peoples;
- are circumpolar and comparative;
- enhance collaboration between researchers and arctic residents, including involving Native peoples in the development, planning, and conduct of research; and
- integrate research and education, particularly projects that relate to research and educational experiences for indigenous peoples and precollege and college-level students.

The interdisciplinary nature of arctic social sciences often calls for innovative methods adapted outside of their usual discipline-specific context. Research that has by its nature a regional—rather than disciplinary—focus provides important opportunities for interdisciplinary research, comparative studies, and studies linked through spatial and temporal scaling.

Comparative research provides an opportunity to see if phenomena uncovered in case studies can be generalized to other areas of the circumpolar North and to other parts of the world. For example, cultural anthropology projects are often case studies in one village, focusing on a particular aspect or several aspects of life, be they cultural, social, familial, or political. These case studies provide interesting and exciting avenues of inquiry for sociologists or political scientists to pursue in comparative studies examining human activities in particular environmental, technological, spatial, cultural, and temporal contexts.

Social scientists have a greater opportunity in the Arctic than elsewhere for extensive cooperation and collaboration with natural and physical scientists (Buckland *et al.* 1996). Logistics issues alone demand cooperation. The potentially large spatial scale of most arctic research projects and the extensive time depth that can amplify most investigations is often best docu-

mented and interpreted in multidisciplinary settings. Other programs within the NSF Office of Polar Programs and foundation-wide initiatives provide additional opportunities for such collaborative, multidisciplinary research.

Arctic social science research may encompass a variety of different temporal and spatial scales. The time period of interest can range from the prehistoric past, as in archaeological research, to the near future, as in efforts to anticipate the consequences of climate change. Research may also vary in its temporal resolution—some studies address relatively brief events, while others examine long-term trends. Spatial scales will likewise vary, ranging from one specific arctic place or settlement, up to regional, circumpolar, and even global topics.

The Arctic provides a rich, interactive, and interdisciplinary context for social science research. The areas outlined in the following chapter offer examples of important research questions that have arisen in this context.

Collaboration and Innovative Partnership

Examples of collaborative projects accomplished through partnerships between scientists, indigenous peoples, and local organizations include the following:

- The Alaska Native Science Commission was established to help provide essential links between researchers and local communities, facilitating communication and cooperation (*Arctic Research of the United States* 1998).
- Social scientists, community leaders, local educators, and rural Alaska high schools collaborated to collect data on student attitudes, expectations, and aspirations from high school students in 19 schools (Seyfrit and Hamilton 1997).
- A social scientist, a biologist, and indigenous peoples documented traditional ecological knowledge about beluga whales in Alaska and the Russian Far East (Huntington 1998, Huntington *et al.* 1999, Mymrin *et al.* 1999).
- Yup'ik elders and a social scientist traveled to Berlin to identify and describe the Yup'ik artifacts collected by Johan Adrian Jacobsen in 1882–83, the largest unresearched and unpublished group of Yup'ik artifacts anywhere in the world (Fienup-Riordan 1997).

2

Research Areas

Research Areas

The three research themes identified in *Arctic Social Science: An Agenda for Action* have inspired outstanding research proposals and projects during the first nine years of the Arctic Social Sciences Program. The five research areas presented in this chapter are intended both to build on these three themes and the research conducted to date and to spur innovative research, broadening the scope of the Arctic Social Sciences Program. While the emphasis in this chapter is on interdisciplinary ideas, discipline-specific proposals and proposals on topics not described here remain welcome and will be reviewed, as is the case with all NSF proposals.

Research Areas

I. Culture and environment
II. Resources and economic change
III. Development of social and political institutions
IV. Ethnic and regional identities
V. Knowledge systems

The five research areas are closely related and often overlapping. They can be considered in local as well as regional contexts, in the present as well as through time. The separate categories in which they are described here are designed only for ease of reading and are not intended to place boundaries between areas of appropriate research. Indeed, the ideas should

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HUMAN ACTIVITIES IN THE ARCTIC DEPEND CLOSELY UPON THE ENVIRONMENT, AND NATURAL OR ANTHROPOGENIC CHANGES IN IT ARE LIKELY TO HAVE FAR-REACHING SOCIAL, CULTURAL, AND ECONOMIC EFFECTS.

be considered together, especially when formulating research questions. In this way, the larger implications of seemingly narrow questions may become apparent, leading to a better understanding of the place of individual projects in the overall development of arctic social science. For example, an investigation of indigenous language retention in a single village may relate to the retention of harvesting practices and to relations with regional institutions and may benefit from an understanding of broader language trends around the Arctic. Thinking in such terms does not diminish the significance or importance of the individual projects, but rather helps promote a more cohesive research program with greater interaction among arctic researchers.

I. Culture and Environment

The ways in which people interact with their biological and physical environments remain a top priority for research. Human activities in the Arctic depend closely upon the environment, and natural or anthropogenic changes in it are likely to have far-reaching social, cultural, and economic effects. Some environmental changes, such as in climate or by long-range transport of contaminants, originate largely outside the Arctic. Others originate within the Arctic—sometimes with the activities of arctic residents themselves—creating feedbacks that drive further social and economic change. The effects of environmental changes on humans and, its converse, the effects of humans on their environment, require

Rear (north) ends of twin prehistoric semisubterranean houses revealed at Pingusugruk, Point Franklin, Alaska, archaeology project (photograph by Glenn W. Sheehan).

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careful study in the present and through the archaeological record (Amorosi 1992, Buckland *et al.* 1996).

Arctic peoples have been highly dependent upon production from locally available resources until relatively recently. Even today, that dependence remains strong in many areas, both by choice and by necessity (Caulfield 1993, 1995, 1997, Condon *et al.* 1995, Freeman 1993, Freeman *et al.* 1998). Arctic peoples have developed patterns of social interaction and resource use that reflect the conditions of their areas; changes in those conditions may affect these cultures and their material and social expression (Maschner in press). Changes may be normal and cyclical, such as natural fluctuations in populations of caribou or marine mammals, or they may be anthropogenic, caused by commercial harvesting, industrial development, or contamination (Mason and Gerlach 1995, Amorosi *et al.* 1997). Furthermore, changes in the structure and size of human populations may change the levels and patterns of wildlife harvests, forcing further changes to the environment and to such social patterns as sharing and cooperative hunting (Hamilton and Seyfrit 1994a, 1994b, Hamilton *et al.* 1996, Hamilton and Otterstad 1998).

Barrow hunters drag an ugruk *(bearded seal) shot by Harry Brower, Jr., into Brower's boat during a summer hunt in the Chukchi Sea north of Barrow, Alaska (© Bill Hess, Running Dog Publications).*

Perceptions of the environment are also an important area for research. Peoples' conceptions of the Arctic—including the attitudes and images of people living outside the Arctic—greatly influence land and resource policies, government programs, and community identity. Is it a storehouse of mineral riches, an

Examples of Research Questions

- How have people responded to environmental changes, such as gradual or catastrophic changes in food supplies, sea-ice cover, or vegetation? What can these responses tell us about our ability to adapt to future changes?
- How has the introduction of cash economies changed the relationship of arctic communities to their environment and its resources?
- How does perception of the environment affect individuals and societies? How do such perceptions influence cultures? How do they influence public policy? How have these perceptions changed over time?

indigenous homeland, a pristine wilderness, or a haven from the trammels of modern life? The interaction of these differing visions is of great significance to the future of the Arctic (Klein 1994, Haggstrom *et al.* 1995).

For individuals, as well as for societies, the arctic physical environment has a tremendous impact. Harsh winters with little sunlight, long periods of summer sunlight, and geographic isolation, singly or in combination, cause variations in activity levels, sleeping and eating patterns, and family and social interactions. Combined with the rapid social change occurring in the Arctic, each of these effects may influence workplace adjustment and productivity and increase the incidence of substance abuse, violence, and suicide, which in turn have societal consequences (Berman and Leask 1994, Kleinfeld 1995–1996, Seyfrit *et al.* 1998).

II. Resources and Economic Change

The resources of the Arctic, broadly defined, include living resources such as fish, timber, waterfowl, and mammals; nonrenewable resources such as hydrocarbons, metal ores, and coal; aesthetic resources such as wilderness and wildlife; and cultural resources such as arts, dances, stories, traditional practices and skills, and museums. Traditional economies have used many of these resources for millennia. Modern economies may combine some elements of traditional practices with large-scale resource development and small-scale innovations and services such as tourism (Caulfield 1997, Condon *et al.* 1995, Wenzel 1995).

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Large-scale economic development dates back centuries, starting with fish, furs, and whales and eventually incorporating oil and minerals. Today, the Arctic remains a rich source of raw natural resources, many of which interest southern markets. Due to inaccessibility and lack of infrastructure, however, in most cases only large-scale projects are economically viable. Large-scale development entails costs for the Arctic as well as offering benefits. Costs include the potential for causing environmental, social, economic, cultural, and political dislocation of arctic residents, among whom traditional land and resource uses remain prevalent. To predict and avoid such dislocation, a better understanding is needed of the characteristics of resource extraction industries and their markets and of the extent to which they affect local economies and cultures (Andréeva *et al.* 1996, Chance and Andréeva 1995, Flanders *et al.* 1998). Reviews of resource use through time as well as of past development can offer insights into the impacts of future projects. Culture may help northern peoples adapt to social and economic changes, and comparative studies can help illuminate its role in determining the nature and scope of impacts (Chance and Andréeva 1995, McGovern *et al.* 1996, McNabb *et al.* in press).

TODAY, THE ARCTIC REMAINS A RICH SOURCE OF RAW NATURAL RESOURCES, MANY OF WHICH INTEREST SOUTHERN MARKETS.

The floor of a drilling rig on the North Slope of Alaska owned and operated by Doyon Native corporation, one of the 13 Alaska Native regional corporations. Doyon Drilling trains and employs as many of its shareholders as possible on its rigs (© James H. Barker).

The Arctic also offers opportunities to examine the social and economic aspects of various approaches to economic management. Modern and traditional economies cooperate or compete for control of access to resources. State monopolies and private companies sometimes take radically different approaches with correspondingly different results. Providing products and services on a

small scale has different consequences for local economies, employment, and societies than does large-scale production for export. Indigenous land claims involve not only attempts to reconcile competing interests and values among indigenous and nonindigenous residents, but also allocation of control over resources that lie within the lands in question (Fondahl 1998, Korsmo 1993a, 1993b, 1995). Assessing the impacts of resource development or allocation in traditional and mixed economies presents methodological challenges that have not yet been resolved.

Examples of Research Questions

- How do public policies affect resource use, and what factors, from global economics to local impacts, influence these policies?
- What are the social, economic, and cultural consequences of resource use and economic development? How do such concerns affect development decisions and practices? Have past impact assessment predictions been accurate?
- How do individuals and communities perceive industrial risks and respond to disasters? How do government policies and programs help or hinder such response?
- What institutional arrangements and organizational structures foster sustainable resource use and community economic development? Under what circumstances do such institutions evolve and thrive?

Emerging institutions of economic management are an important topic for research. These institutions include indigenous regional and village corporations, tribal organizations, and co-management bodies for natural, especially renewable, resources. Wildlife managers, for example, are increasingly making use of co-management bodies. Each of these institutional structures and each combination of institutional structures affects the development, use, and conservation of natural resources and the distribution of the benefits that derive from those resources (Collings 1997).

Economic and development policies in the Arctic are also a fruitful area of research. Factors that shape such policies, ranging from the need to accommodate traditional practices to effects of

external economic and political crises, are important to characterize and understand. How policies promote or impede socially and culturally sound resource use and development is likewise an important question (Freeman *et al.* 1998). These questions are relevant on local as well as regional scales and should take into account changes in local patterns of resource use over time. Furthermore, it is important to understand the long-term consequences of such policies. For example, if policies promote conversion from a subsistence-based economy to a more cash-based economy, repercussions are felt throughout a society; the shift affects not only economic practices but also settlement patterns, community social structure, regional political organization, and cultural change (Andréeva *et al.* 1996, Brown *et al.* 1997, Chance and Andréeva 1995, Flanders *et al.* 1998, Larichev *et al.* 1995).

At a special session of the Association of Village Council Presidents in 1980, participants discuss their concerns about proposed off-shore oil exploration and development of the Bering Sea (© James H. Barker).

III. Development of Social and Political Institutions

Social and political institutions in the Arctic are dynamic and complex, rooted, in part, in the history of cooperation and conflict between indigenous and nonindigenous cultures, economies, and political systems. Today, new structures of governance and models of social development are emerging that seek to meet the challenges of geography and to accommodate the distinct values of indigenous and nonindigenous residents of the North (Korsmo 1993a, 1993b, 1996). Understanding the lessons of past and present patterns of social and political development is important to the well-being of arctic residents and will also lead to a better understanding of comparable processes in other parts of the world (Fagan and Maschner 1991, Maschner and Patton 1996).

2 Research Areas

Arctic residents, especially indigenous peoples, have been subject to rapid and far-reaching social change, a result of the comparatively late colonization of the Arctic and the consequences of industrial resource development, especially since the Second World War (Burch 1995, Condon 199[illegible], Fienup-Riordan 1997, Sprott 1992, 1997). More recently, the social, economic, and political changes occurring in the former Soviet Union have caused major upheavals in the Russian North (Fondahl 1995, 1996a, 1996b, 1998, Krupnik 1998, McNabb *et al.* in press). Yet, many facets of arctic indigenous societies have demonstrated considerable resilience and continuity in the face of this change. The patterns and institutions of social development, including their continuity and change, have had enormous consequences for the well-being of indigenous and nonindigenous residents alike.

The new territory of Nunavut, based on Inuit land claims in northern and eastern Canada, governs about 20% of the area of the country (map from Mountain High Maps, revised by Sue Mitchell).

The urgency of this area of research is underscored by the gravity of the social problems that characterize many northern communities. Social scientists still lack an adequate understanding of the connection between social well-being (*e.g.*, family, education, religion, economic security) and change. Part of this limitation stems from the implicit and explicit definitions of welfare and social well-being—the same indicators are frequently applied to disparate peoples and societies. Better comprehending the interactions between change and social well-being will demand innovative theoretical and methodological approaches.

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Political development involves change and continuity in the institutions and processes of public decision making. In the Arctic, three dimensions of public decision making are particularly important: devolution, the passing of powers to local authorities from a central government; self-government; and international cooperation.

Across the Arctic, central governments have given increasing authority to regional and local governments. Different interests and values of indigenous and nonindigenous residents and declines in available financial resources, however, have made this devolution a complex issue. The response of local and regional governments to these pressures remains to be seen. The quest for self-government by indigenous peoples forms an increasingly dynamic area of constitutional and political development (Korsmo 1993a, 1993b, 1999). How will federal and state governments respond to the increasing involvement of indigenous peoples and organizations that require co-management or self-governance, and what form will the required adaptations take? Finally, the development of the Arctic Council—a high-level policy forum for discussing environmental and other nonmilitary issues of common concern in the circumpolar arctic region—and other international arctic institutions and organizations is reshaping

Examples of Research Questions

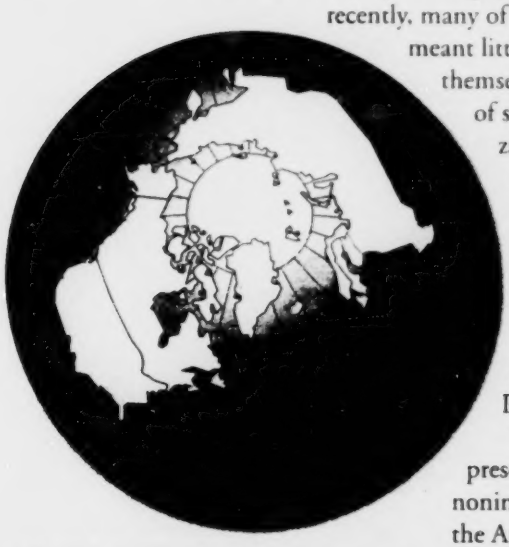
- How have new social and political institutions arisen in the Arctic? What can this process teach us about the regional, national, and international institutions emerging today?
- How do such institutions reflect the relationship of indigenous and immigrant populations? How do they reflect the relationship of regional and national governments?
- What are the consequences of the social and economic changes occurring in the Russian North? What are the prospects for social, economic, and cultural recovery of that region?
- How can arctic residents effectively exercise the greater governing authority they seek? Will local control help solve some of the social ills that plague many arctic communities?
- How have traditional governance structures regulated social behavior? To what extent do such structures affect social and political institutions today, and with what consequences?

the decision-making processes among and within countries. The role that international institutions and organizations will play in these changing public decision-making processes remains an important question (Young 1994, 1996a, 1996b, Young and Osherenko 1993).

THE INTERACTIONS AMONG MINORITY GROUPS AND THE CONSEQUENCES FOR IDENTITY ARE BECOMING INCREASINGLY COMPLEX AND SIGNIFICANT.

IV. Ethnic and Regional Identities

Historically, the indigenous peoples of the Arctic have constituted a multitude of localized small-scale societies. Since the 19th century, social scientists have classified these diverse groups into a few ethnic categories—Inuit, Saami, Nenets, for example—largely based on linguistic criteria. Until recently, many of these broad ethnic categories meant little to the indigenous peoples themselves. In political terms, the absence of state institutions or similar organizational structures beyond the community level precluded the emergence of national identities. Emerging group identities and political structures, however, have far-reaching implications both locally and internationally (Fondahl 1996a, Krupnik 1996, Pullar 1992, Seyfrit *et al.* 1998).



All arctic communities belong to one of eight countries—Canada, Denmark (Greenland), Iceland, Norway, Sweden, Finland, the Russian Federation, and the United States (map from Mountain High Maps, revised by Russ and Sue Mitchell).

They are also affected by the presence of large numbers of nonindigenous residents in all regions of the Arctic. These migrants and immigrants—from the Pomors in Russia centuries ago to Filipinos in Barrow, Alaska, and Tamils in Finnmark, Norway, today—have formed their own identities and communities, sometimes in connection with indigenous peoples and sometimes separately. As a result, the

interactions among minority groups and the consequences for identity are becoming increasingly complex and significant (Balzer 1994, Grant 1995, Lotkin 1996, Missonova 1995).

Today, all arctic communities belong to one of eight countries—Canada, Denmark (Greenland), Iceland, Norway, Sweden, Finland, the Russian Federation, and the United States—with distinct and diverse political traditions. By necessity, local communities in the Arctic have to recognize and cope with belonging to one of these states, most of which were formed by colonialist expansion and thus informed by southern conditions and values. While indigenous societies often see their homelands as land-sea continua to which political boundaries are irrelevant, modern analysis typically considers nations and regions to be discrete (Schweitzer 1997, Schweitzer and Golovko 1997). Government policies often have imposed or given significance to ethnic distinctions, by conferring special rights and privileges or by forcing assimilation (Korsmo 1998). The maintenance of language and cultural traditions greatly influences the degree to which indigenous groups retain their identities and the relationships they create with the nation or nations of which they are now part (Hensel 1996, Krupnik 1991).

In small towns such as Rybnoe on North Sakhalin Island, Russians and Nivkhi have been living and working together for the last 100 years (photograph by Douglas Vogt, 1990).

The eight arctic nations, with the possible exception of Russia, generally can be characterized as affluent First World countries with democratic institutions and a highly developed infrastructure. As a result, the formulation and achievement of indigenous rights in the Arctic has followed a different course than in the developing world (Freeman 1993, Korsmo 1993a, 1993b, 1996). In addition, in recent decades the Arctic has seen devolution of authority from central governments to the regional or local governments in territories where the indigenous

Examples of Research Questions

- On what basis are group identities established? How has this basis changed over time? How do individuals show their identification with a group? How does the remoteness and isolation of the Arctic influence group identity?
- Are group identities changing, for example, by merging to larger groups or diversifying into smaller ones? If so, how?
- How do perceptions of ethnic identity affect the development of political movements, such as the quest for self-governance?
- What factors influence individual choices and perceptions regarding group identity? To what extent do individuals identify with several groups? What implications do these patterns have for individuals and for arctic cultures and societies?

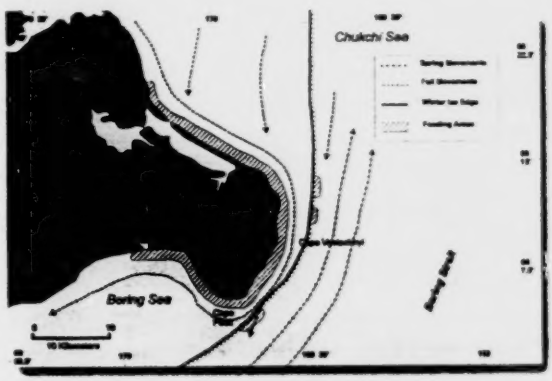
inhabitants form a majority of the population (Fondahl 1998, Korsmo 1993b). Indigenous communities based in part on emerging group identities have created new social and political networks between and within arctic nations (Young 1994, 1996b, Young and Osherenko 1993). In many such instances, relatively small populations influence access to large and valuable natural resources, giving those populations a major role in national and even global economies. The process of devolution and organizational development both reflects and influences group identities and has created important challenges and opportunities for arctic residents.

Arctic group identities have been undergoing pronounced changes and will continue to do so. The transition from small-scale societies to members of the global community has been more rapid in the Arctic than in most other areas. Since the various phases of this transition can be relatively successfully reconstructed, there are diverse opportunities for research on past, present, and future processes. Such research may be of interest to local residents, to academics examining processes of nationalism and ethnic identity in other regions, and to individuals and organizations involved in formulating public policy.

V. Knowledge Systems

Knowledge systems—the ways in which individuals and cultures gather, store, analyze, and disseminate information—greatly influence perception and understanding of the world. They are, in turn, influenced by culture, history, and ideology. Exploring the basis for and characteristics of different knowledge systems is an important step in understanding cross-cultural interactions (Morrow 1992, 1993). In the Arctic, interactions between indigenous and immigrant cultures occur on many levels and have far-reaching implications. Indigenous practices, languages, and beliefs may be altered or replaced by ones from the immigrant culture. At the same time, the perceptions and perspectives of indigenous cultures continue to influence and be influenced by their political, social, economic, and even scientific interactions with the dominant society (Krupnik and Vakhtin 1997).

The study of knowledge systems is a rapidly growing area, branching in many directions and encompassing a variety of concerns, issues, and circumstances (Fehr and Hurst 1996). For example, most indigenous languages in the Arctic are in danger of dying out, replaced by the language of the dominant society. Detailed terminology developed for a particular environment and culture is being lost, perhaps along with much of the associated knowledge system. The factors involved in language loss and the way in which it affects the learning process, the transmission of culture, and the development of identity are not well understood.



This map shows traditional knowledge of beluga whale migrations and related ecological and environmental information from Uelen, Chukotka, Russia (Nikolai I. Mymrin and Henry P. Huntington). Mapping is one technique that can help make knowledge systems accessible.

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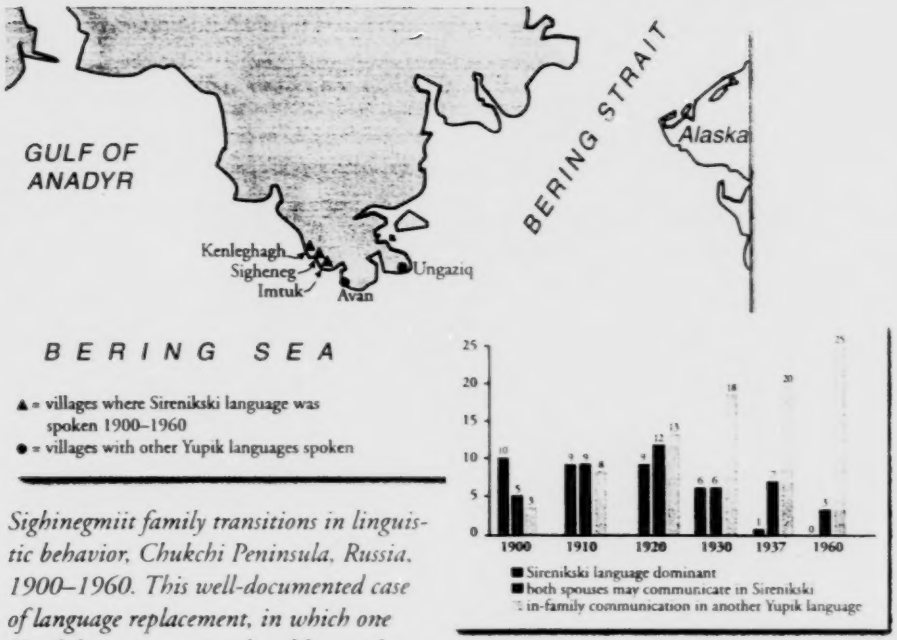

Sighinegmiit family transitions in linguistic behavior, Chukchi Peninsula, Russia, 1900–1960. This well-documented case of language replacement, in which one Yupik language was replaced by another Yupik language, illustrates the variability of language shifts in the circumpolar North. Adapted from Igor Krupnik (1991) by Sue Mitchell.

Studying knowledge systems also is important for resolving conflicts over the use of natural resources. Indigenous arctic cultures have developed systems of ecological knowledge that are effective for hunting and gathering success, navigation, and survival (Gottesfeld and Hargus 1998, Huntington 1998, Huntington *et al.* 1999, Mymrin *et al.* 1999). Conflicts over resources may stem in part from different knowledge systems, and the resolution of such conflicts may depend upon an ability to bridge those differences.

These and related issues are of particular importance in the Arctic because distinct knowledge systems continue to exist today, because differences in knowledge systems can lead to conflict, and because many communities have expressed the

desire to use their knowledge to guide the design and operation of new cooperative institutions. The study of these matters can benefit from experiences elsewhere, and the results of such studies are relevant in other settings.

Research Areas: A Summary

These five research areas are intended to build on the three research themes identified in *Arctic Social Science: An Agenda for Action* and to spur innovative research. While the emphasis is on interdisciplinary ideas, discipline-specific proposals remain welcome in the Arctic Social Sciences Program. These research areas are described here in separate categories to allow ease of reading, but they are closely related and often overlapping. Considering these ideas together, especially when formulating research questions, helps promote a more cohesive research program.

Examples of Research Questions

- What implications do differences and similarities in knowledge systems have for fields such as wildlife management, education, and economic development?
- How does language loss influence the perception of a distinct indigenous knowledge system?
- In what context are the calls for greater involvement of local and indigenous knowledge made? How can such involvement contribute to community development?
- How have local and indigenous knowledge systems been affected by government policies? How are they being taught today? How does the spread of information technology and technology transfer affect knowledge systems and values? How does the act of seeking knowledge from others affect the relationship between those who gather and those whose knowledge is gathered? How is this relationship further affected by the way or ways in which that knowledge is used?

3

Working in the Arctic

Working with Arctic Residents

This chapter outlines a number of considerations related to the physical, social, and academic environments in which arctic social science research is conducted. Scientists, community representatives, and the National Science Foundation should take these points into account when preparing proposals, carrying out projects, and developing strategies for supporting safe and effective research in the Arctic.

Arctic people today express concerns about changes in their regions and are working to improve their communities. They can and do use knowledge from the social sciences to protect their cultures, educate their children, preserve their languages, gain rights, and perpetuate their ways of life. Like people everywhere, arctic residents are increasingly exposed to technological innovations and involved in the networks of contemporary society. In this context of increased awareness and better communication, arctic social scientists, along with the broader scientific community, have the opportunity and responsibility to work closely with arctic residents to improve the contributions of their research to local communities. Several organizations are working to support researcher-community interactions, including the Alaska Native Science Commission and similar organizations or processes in other arctic countries. Direct and

regular communication among researchers, funding agencies, and arctic peoples will help to identify needs and ensure conduct of proper and effective arctic social science research.

For researchers, the *Principles for the Conduct of Research in the Arctic* (see page 55) provide overall guidance for research practices. A central tenet of responsible research conduct involves cooperative community relations and education. Researchers are responsible for initiating and sustaining communication with residents, including discussing their research, responding to community concerns, and modifying their approach to suit community interests if needed and feasible. Arctic residents may provide insights into methods and procedures that will improve a project and its chance of success. Residents may also suggest additions to research objectives that will satisfy a local need or interest. In some places, the diversity of local needs in social science research, reflecting the changing group identities of arctic residents, may form part of the questions to be investigated. In other situations, local residents or organizations may have potentially significant objections to some aspect of a project, requiring changes to the budget or scope of the research or affecting the scientific integrity of the project. In these cases, negotiation of research plans with the local community will be of critical importance. In yet other situations, local politics as well as conflicting identities of place and kinship may make community consensus impossible, and researchers will not be able to negotiate clear agreements. When successful—from initial discussions to presenta-

ARCTIC RESIDENTS MAY PROVIDE INSIGHTS INTO METHODS AND PROCEDURES THAT WILL IMPROVE A PROJECT AND ITS CHANCE OF SUCCESS.

Dr. Richard Caulfield, University of Alaska Fairbanks, interviewing Nuuk hunter Kristian Egede in Greenland about procurement of country foods (photograph by Kim A. McDonald, The Chronicle of Higher Education*).*

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tion of interim and final results—the process of involving community interests can involve substantial collaboration and education, combining local knowledge of how to get things done, more formal traditional knowledge, and scientific insight (Fehr and Hurst 1996).

Arctic social scientists face a new set of opportunities and challenges in working with arctic residents as changes in communication, transportation, education, and political systems bridge the vast physical and cultural distances that once separated researchers from the people and systems that they studied. These changes, along with evolving approaches to the conduct of research in the North, require and encourage the development of real partnerships between social scientists and northern communities, based on mutual respect and community involvement.

Education and Outreach

The Arctic Social Sciences Program is committed to developing educational components that link scientists with students and other members of arctic communities and to training young scientists. Working in and communicating with local communities, discussed in the previous section, offers educational opportunities that can be deeply meaningful to arctic residents, particularly when local students and community members become involved with the research process (Seyfrit and Hamilton 1997).

Supporting links to elementary and secondary education, both in and outside of the Arctic, is an important aim of the Arctic Social Sciences

The Archaeological Training Institute—sponsored by the Ukpeagvik Inupiat Corporation in Deering, Alaska, in 1998—included residents from the community and a high school teacher and student from New York state sponsored by the NSF-funded Teachers Experiencing the Arctic program. Deering residents and the TEA teacher and student learned on the job, working beside experienced excavators, which allowed questions and answers throughout the day (photograph by Aaron Stupple).

Teacher Mary Ann Holmquist and Barrow students helped researchers Anne Jensen and Glenn Sheehan in the NSF-funded excavations that recovered Agnaiyaaq, the frozen girl of Ukkuqsi. Agnaiyaaq died about 800 years ago at age six. When the scientific studies were complete, she was reburied with letters the students had written to her (© James H. Barker).

Teacher Mary Ann Holmquist, center, and North Slope Borough employee Karen Brewster, left, watch as a student digs for "artifacts." Children created their own archaeological site in the classroom in Barrow, Alaska, creating artifacts and practicing digging the site, recording the locations of their finds, and describing the individual artifacts. The students invited an archaeologist to lecture in their class and hosted a traveling archaeological exhibit funded by the National Science Foundation (© James H. Barker).

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Program. As social scientists working in the Arctic engage students, they can stimulate curiosity at an early age and teach the relevance of research to students' lives. Archaeologists bringing groups of elementary students into an excavation site or to a museum exhibit, for example, can turn science into an exciting venture for children. As a result, students will gain a more complex understanding of the issues facing people in the North and will use this knowledge in a variety of ways as they grow to adulthood. These educational efforts also promote a better understanding of publicly funded research and improve popular awareness of the Arctic as a critical component of the global environment.

AS SOCIAL SCIENTISTS WORKING IN THE ARCTIC ENGAGE STUDENTS, THEY CAN STIMULATE CURIOSITY AT AN EARLY AGE.

Researchers also need to explain the relevance of social science for the Arctic and the significance or usefulness of their results for the general public. Reaching the largest possible audience via regional and national television, Internet, traveling exhibits, popular publications, and where possible, including local residents in the dissemination of the results will yield important results in terms of public support and community partnerships. Increasing use and development of communications and educational infrastructures (*e.g.*, community-based electronic networks, Web sites, compressed video, etc.) will help investigators reach these important audiences.

With each of these aims—educating local

A crew consisting of graduate, undergraduate, and high school students from Canada and the United States begins erecting a shelter over an 18th century midden at the Uivak Point 1 archaeology site in Labrador. Local students make up part of the crew and have been trained to excavate and survey. Community members have been invited to stop by to see the work in progress (photograph by Susan A. Kaplan).

people, students, and the general public—educational components of research projects must be adequately developed and supported. While individual research projects have a responsibility to incorporate and propose educational activities, broader planning efforts are needed as well. Where research is related to the lives of northern communities, those communities should have a primary role in developing educational projects related to social science research.

Integration of research and education has become an important goal at the National Science Foundation. The Arctic Social Sciences Program supports young social scientists with Dissertation Improvement Awards, and support for graduate and undergraduate assistance is also available for research projects. Research Experiences for Undergraduates (REU) supplements for NSF-supported projects integrate research and education at the university and college levels. Large interdisciplinary, crosscutting programs at NSF, such as Integrative Graduate Research and Education Training Program (IGRET), also have strong educational components and encourage collaboration between diverse institutions and disciplines.

Chukchi reindeer herder Ivan Tanko in front of an ATV he was driving near Getlyangen Lagoon, approximately 100 km north of the village of Yanrakynnot on the Chukchi Peninsula (photograph by Peter P. Schweitzer).

Logistics Support

Scientific work in the Arctic depends heavily on logistical support. Logistics for work in high latitudes often are challenging, require special technology, and are costly. The logistical needs of social scientists are diverse. Many social scientists work within communities that can be reached by regular air service; board and lodging are not always commercially available, but alternatives include private homes, schools, and vacant

dwellings. Other social scientists, such as archaeologists, must travel to remote areas, bringing their equipment, research team, and living quarters with them. In some cases social scientists have had to choose research based more on where and how they could access an area, rather than on the questions they consider most important.

A recent report sponsored by the U.S. Arctic Research Commission outlines recommendations for improving logistics support for arctic research generally (Schlosser *et al.* 1997). These recommendations were developed by the arctic research community. They will, if implemented, greatly enhance the ability of social scientists to carry out important research and to involve arctic residents closely in planning and conduct of such research.

This report recommended that, in general, access to the Arctic over the entire year must be ensured, availability and use of remote and autonomous instruments must be increased, the health and safety of people conducting research in the Arctic must be protected, communication and collaboration between arctic peoples and the research community must be improved, and interagency, international, and bilateral logistics arrangements should be sought to use available resources efficiently and reduce costs by avoiding duplication of efforts.

From drinking water to all-terrain vehicles, this Twin Otter brought in supplies and personnel to the Point Franklin Archaeology Project on Peard Bay, next to the Chukchi Sea on Alaska's North Slope (photograph by Glenn W. Sheehan).

A tent camp on Attu Island in Alaska's Aleutian chain. Researchers studied the people of the western Aleutians in a combined study of archaeology, historical ecology, molecular biology, and ethnography to better understand the history and environment of the isolated islands (photograph by Dixie West).

A major issue in improving logistics support specifically for social science research is facilitating communication into and from arctic communities. Improved communication requires investment both in personnel and in modern technology. For example, research would benefit from the identification of individuals to act as community-based central points of contact and from support for travel to communities to plan research and communicate results. Coordinating and collaborating with various organizations already involved in arctic regions also would maximize the use of logistical resources. Access to a communications infrastructure varies tremendously among arctic communities, with many having limited or no access to modern systems. For example, the technological improvements and expansions to communications systems in rural Alaska currently under discussion would make services such as telephone, fax, and e-mail more common, facilitating the interactions of researchers with rural communities. Greater availability of global satellite telephone communication (INMARSAT) for social scientists working in remote areas would markedly improve safety and communication in many areas of the Arctic.

A Bowdoin College student checks equipment that has just been unloaded from a boat onto the shore of Iglosiatik Island, Labrador. The gear will be used to excavate a 16th century Inuit sod house village discovered in a fossil cove on this outer island (photograph by Susan A. Kaplan).

Working in the Arctic: Summary

As arctic communities become increasingly accessible through changes in communication, transportation, and political systems, social scientists working in the Arctic can anticipate a new confluence of research opportunities. Social science now must engage in the challenge of developing effective partnerships with arctic residents, contributing to education programs in and outside arctic communities, and advocating for needed collaborative agreements and investments in logistics.

4

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National Science Foundation Awards in Arctic Social Sciences, 1991–1999

The following list includes projects that have received funding under the NSF Arctic Social Sciences Program from 1991–1999. Awards are listed in alphabetical order by principal investigator. For abstracts on each project, see the National Science Foundation web page Fastlane program: <http://www.fastlane.nsf.gov/a6/A6Start.htm>, click on "List of Awards by NSF Program," type in "Arctic Social Sciences," and follow instructions.

Ackerman, Robert E.

An Archaeological and Paleoecological Study of the Late Pleistocene to Early Holocene Occupants of the Lime Caves in Southwestern Alaska. 1995–1999. Washington State University.

Early Prehistoric Occupation of Southwestern Alaska. 1997–1998. Washington State University.

Late Pleistocene/Early Holocene Hunter/Gatherer Occupation of Southwest Alaska. 1992–1994. Washington State University.

Anderson, Douglas D., and Wanni W. Anderson. *Human Subsistence Practices in Response to Environmental Fluctuations in Northwestern Alaska During the Last Millennium.* 1991–1994. Brown University.

Ashley, Gail M., and Natasha Malyk-Selivanova. *Determination of Chert Sources of Pre-Historic Artifacts, Northwestern Alaska.* 1994–1995. Rutgers University, New Brunswick.

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5 National Science Foundation Awards in Arctic Social Sciences, 1991–1999

Badger, Mark O., and Asen Balikci. *Introduction of Contemporary Visual Anthropology Methods with the Native Peoples of Siberia and Alaska.* 1991–1995. University of Alaska Fairbanks.

Barnhardt, Raymond J. *Doctoral Dissertation: The Impact of Indian Education at Sheldon Jackson School; 1881–1940.* 1992–1994. University of Alaska Fairbanks.

Bender, Thomas R.

International Workshop on Archaeological Human Remains: Examining the Past to Protect the Future. 1996–1997. International Union of Circumpolar Health.

International Workshop on Ethical Issues in Health Research Among Circumpolar Indigenous Populations. 1995. International Union of Circumpolar Health.

Berman, Matthew A. *Joint U.S.-U.S.S.R. Workshop: Native Welfare and Vital Statistics in the Soviet Northeast and Alaska.* 1992. University of Alaska Anchorage.

Black, Lydia T. *Symposium: Ioann Veniaminov in Alaska and Siberia and His Contributions to Arctic Social Science, University of Alaska, Fairbanks, December 5–7, 1997.* 1997–1999. University of Alaska Fairbanks.

Black, Lydia T., and Patricia H. Partnow. *Alutiiq Ethnicity.* 1992–1994. University of Alaska Fairbanks.

Brown, Rex V. *Logical Frameworks for Making and Justifying Arctic Development Decisions: Russian and U.S. Approaches.* 1992–1995. George Mason University.

Burch, Ernest S., Jr.

A Directory of Arctic Social Scientists. 1994–1997. Individual Award.

Robert Spencer's North Alaskan Eskimo—40 years later. 1999–2000.

Castro, Alfonso. *Cree Hunters' Responses to Resource Development in James Bay, Quebec.* 1994–1995. Syracuse University.

Caulfield, Richard A. *Indigenous Knowledge and Practice in Changing Greenlandic Resource Management Regimes.* 1994–1997. University of Alaska Fairbanks.

Caulfield, Richard A., and Gordon L. Pullar. *Workshop: Indigenous Peoples and Arctic Social Sciences: Building on the Alaskan Experience.* 1995. University of Alaska Fairbanks.

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Chagnon, Napoleon A. *Doctoral Dissertation Research: Kinship, Economic Organization, and Ethnicity Among the Dolgan of Arctic Siberia.* 1996–1997. University of California Santa Barbara.

Cochran, Patricia A. *Workshop of the Social Transition in the North Project.* 1996–1999. Alaska Federation of Natives.

Coltrain, Joan B. *Stable Carbon and Nitrogen Isotope Analysis of Eastern Canadian Arctic Populations with ^{14}C Chronologies.* 1998–2000. University of Utah.

Condon, Richard G., and George Wenzel. *Subsistence Hunting as an Economic/Ideological Adaptation Among Young Canadian Inuit Adults.* 1992–1994. University of Arkansas Main Campus.

Dixon, E. James. *Late Quaternary Archaeology and Geology of Southeast Alaska Karst.* 1995–1996. Denver Museum of Natural History.

Draper, Patricia. *Doctoral Dissertation Research: Aging and Intergeneration Family Dynamics in Copper Inuit Community.* 1997. Pennsylvania State University, University Park.

Dumond, Don E.

Doctoral Dissertation Research: Portrait of Nash Harbor: Prehistory, History, and Lifeways of an Alaskan Community. 1996–1998. University of Oregon Eugene.

Archaeology of a Late Prehistoric Ethnic Frontier, Naknek River, Alaska. 1998–1999. University of Oregon Eugene.

Earle, Timothy K., and Rita S. Shepard. *Selective Change and Adaptation Revealed Through Archaeology: The Unalakleet River, Alaska.* 1992–1993. University of California Los Angeles.

Ellanna, Linda J. *Seventh International Conference on Hunting and Gathering Societies, Support.* 1992–1994. University of Alaska Fairbanks.

Fair, Susan W., and Thomas F. Thornton. *Qamani II: Toponyms and Site Information Regarding Lands Along the Tapqaq and Saniniq Coasts and in Bering Land Bridge National Preserve.* 1997–1998. Shishmaref Native Corporation.

Fienup-Riordan, Ann, and Marie Meade. *Yup'ik Elders in Museums: Central Yup'ik Indigenous Knowledge Project.* 1997–2000. Association of Village Council Presidents.

Fischer, Victor, and Patricia A. Cochran. *Conference: Northern Native Communities Development.* 1997–1998. University of Alaska Anchorage.

Fitzhugh, William W. *Preparation of Internet Profiles on NSF Arctic Social Science Projects for Presentation on the Arctic Studies Center's Web Site.* 1996–1997. Smithsonian Institution.

Flanders, Nicholas E.
The Cultural Ecology of Protected Natural Areas Under Continuing Human Use. 1994–1997. Dartmouth College.

Integrating Traditional and Scientific Knowledge in Large Mammal Research. 1997–2001. Dartmouth College.

Fondahl, Gail A. *Evolving Land and Resource Tenure Systems in the Russian North.* 1993–1994. Dartmouth College.

Gerlach, S. Craig, and Lisa J. Graumlich. *Establishing the Chronologic and Climatic Correlates of Late Holocene Cultural Development in Northwest and Northern Alaska.* 1991–1993. University of Alaska Fairbanks.

Gladden, James N. *Wilderness Policies and Cultural Values in Finland and the United States.* 1998. University of Alaska Fairbanks.

Goldstein, Lynne G. *Dissertation Improvement Grant: A Comparative Analysis of Inuit Mortuary Practices from Prehistoric Times to the Influences of Christianity.* 1996–1997. University of Wisconsin Madison.

Goodale, Jane C. *Contemporary Tlingit Family, Kinship, and Marriage: The Impact of Change.* 1994–1995. Bryn Mawr College.

Grayson, Donald K. *Dissertation Research: An Examination of Lithic Technology During the Transition from Late Pleistocene to Modern Environments in the Upper Kolyma Region, Western Beringia.* 1996–1998. University of Washington.

Guthrie, R. Dale. *The Chronology and Ecology of Postglacial Colonization of the Americas.* 1993–1995. University of Alaska Fairbanks.

Hamilton, Lawrence C., and Cynthia M. Duncan. *Human Adaption to Large-Scale Ecological Decline: A Comparative Study of North Atlantic Fishing Communities.* 1996–1999. University of New Hampshire.

Hammer, Michael F. *U.S.-Russia Joint Collaborative Research: Y Chromosome Variation in Native Human Populations of Siberia.* 1995–1998. University of Arizona.

Hammer, Michael F., and Tatiana Karafet. *U.S.-Russian-Mongolia Joint Collaborative Research: Paternal Population Structure and History in North and Central Asia.* 1998–2001. University of Arizona.

Hargus, Sharon. *Babine-Witsu Wit'en Verbal Morphology.* 1993–1996. University of Washington.

Harritt, Roger K. *Whale Hunting Societies of the Western Arctic: A Regional Integration (Archaeology and Sociocultural Components).* 1998–2001. University of Alaska Anchorage.

Harritt, Roger K., and Barbara A. Bodenhorn. *Western Arctic Whale Hunting Societies: Origins, Development, Environmental Responses, and Contemporary Sociocultural Dimensions-Sociocultural Component.* 1996–1998. University of Alaska Anchorage.

Harritt, Roger K., Barbara Bodenhorn, Carol Jolles, Owen Mason, Mary Larson, Herbert Anungazuk, Allen McCartney, James Savelle, Howard Braham, and Craig George. *Origins and Development of Western Arctic Whale Hunting Societies.* 1995–1996. Alaska Eskimo Whaling Commission.

Hensel, Chase. *Structuration in Cross-Cultural Interaction: Yup'ik Eskimos and Non-Natives.* 1994–1995. Association of Village Council Presidents.

Holmes, Charles E. *Archaeology and Paleoecology of the Broken Mammoth and Mead Sites, Central Alaska.* 1991–1993. State of Alaska Office of History and Archaeology.

Hunt, Robert C. *Doctoral Dissertation Research: A Study of the Socioeconomic Organization of an East Greenlandic Mixed Cash/Subsistence Economy.* 1994–1996. Brandeis University.

Huntington, Henry P. *Traditional Ecological Knowledge of Beluga Whales: An Indigenous Knowledge Pilot Project in the Chukchi and Northern Bering Seas.* 1995–1998. Inuit Circumpolar Conference.

Jarvenpa, Robert, and Hetty J. Brumbach. *Gender Dynamics and Subsistence Systems in Circumpolar Societies: An Ethnoarchaeological Interpretation.* 1998–2000. State University of New York, Albany.

Johnson, Lucy L. *The Development of Cultural Complexity in the Shumagin Islands.* 1993–1997. Vassar College.

Jolles, Carol Z.

Sivuqaghhmiit History and Culture: Values for Survival in a Changing World. 1992–1995. University of Washington.

Yupik Women, Yupik Families: A Comparative Study of Siberian Yupik and St. Lawrence Island Yupik Family Life. 1996–1998. University of Washington and Indiana University Bloomington.

Jones, Eliza. *Towards a Theory of a Culturally Representative Visual Ethnography in the Arctic: Alaska and Siberia.* 1992–1994. University of Alaska Fairbanks.

Kaplan, Susan A.

Bowdoin College Labrador Archaeology Project 1993–98. 1993–1998. Bowdoin College.

LINK: A Science Planning Workshop. 1995. Bowdoin College.

LINK: Small-Scale Societies of the North Atlantic. 1996–1998. Bowdoin College.

Kellert, Stephen R., and Milton M. Freeman. *Public Attitudes to Whales and Whaling: An International Study.* 1992–1993. Yale University.

Kingston, Deanna. *The Use of King Island Inupiat Songs and Dances in Preserving Cultural Identity.* 1995–1997. Smithsonian Institution.

Kleinfeld, Judith S. *Northern Women, Northern Lives. An International Conference on Women in the Circumpolar North.* 1994. University of Alaska Fairbanks.

Koester, David C.

Dissertation Grant: The Dynamics of Memory and History in a Former Soviet Penal Colony: An Anthrohistorical Study of Magadan, Siberia. 1997–1998. Columbia University.

Workshop to Coordinate Projects Among Environmental and Cultural Researchers in Kamchatka, Russia, March 1997. 1997–1998. Columbia University.

Koester, David C., and Alexander Alland. *Doctoral Dissertation Research: Cultural Revival in Bella Coola: Art, Appropriation, and National Identity.* 1996–1999. Columbia University.

Krupnik, Igor I.

Survival in Contact Asiatic Eskimo Transitions: 1900–1990. 1992–1994. Smithsonian Institution.

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The Beringian Yupik Heritage Project: The Population History Sourcebook of St. Lawrence Island, 1880–1998. 1998–2000. University of Utah.

Kruse, John A.

Doctoral Dissertation: Community Involvement in Cooperative Resource Management; Porcupine Caribou Herd. 1993–1995. University of Alaska Anchorage.

Partial Support of a North American Symposium to Advance Understanding of Harvest Assessment Methods in Rural Northern Communities, Girdwood, Alaska, April 20–22, 1995. 1995–1996. University of Alaska Anchorage.

Kruse, John A., and Robert G. White. *Sustainability of Arctic Communities: Interactions Between Global Changes, Public Policies, and Ecological Processes.* 1995–1999. University of Alaska Anchorage.

Larson, Dorothy M.

Alaska Native Science Commission Workshops. 1994–1995. Alaska Federation of Natives.

Alaska Native Science Commission. 1996–1999. Alaska Federation of Natives.

Larson, Dorothy M., and Patricia A. Cochran. *Alaska Native Science Commission.* 1996–1999. Alaska Federation of Natives.

Lee, Molly.

An Ethnohistory of Yup'ik and Inupiat Women's Culture. 1995–1998. Association of Village Council Presidents.

Weaving Culture: An Aesthetic Ethnohistory of Yup'ik and Iñupiaq Eskimo Coiled Basketry. 1998–2000. University of Alaska Fairbanks.

Leik, Robert K., Sheila A. Leik, Thomas Choi, and Jon B. Christianson. *Privatization of Nordic Health Care.* 1999. University of Minnesota—Twin Cities.

LeMoine, Genevieve M.

Identification of Historic Photographs from Northwest Greenland. 1997–1998. Bowdoin College.

Northwest Greenland Photograph Identification Project. 1998–2000. Bowdoin College.

Marcus, George E. *Memory and Forgetting Among the Nivkhi of Sakhalin Island.* 1992–1993. William Marsh Rice University.

5 National Science Foundation Awards in Arctic Social Sciences, 1991–1999

Maschner, Herbert D. G.

Dissertation Research: The Organization of Complexity: A Study of Late Prehistoric Village Organization in the Eastern Aleutian Region. 1996–1998. University of Wisconsin Madison.

Remote Sensing and Geographic Information System Development for Archaeological, Ecological, and Geomorphological Reconnaissance on the Peninsula. 1996–1999. University of Wisconsin Madison.

Workshop: Aleutian Research Consortium. 1997–1999. University of Wisconsin Madison.

Landscape and Environment in the Organization of Aleut Society: Behavioral Responses to Catastrophic and Gradual Change in Coastal Regions. 1999–2003. University of Wisconsin Madison.

McCartney, Allen P. *Russian Translation Project, Arctic Anthropology.* 1991–1997. University of Arkansas.

McCartney, Allen P., James M. Savelle, and John C. Dixon. *Whale Hunting Societies of the Western Arctic: A Regional Integration.* 1998–2001. University of Arkansas.

McCartney, Allen P., John C. Dixon, and James M. Savelle. *Western Arctic Whale Hunting Societies: Whale Biometrics and Environments.* 1996–1998. University of Arkansas.

McGovern, Thomas H. *Dissertation Improvement Grant: Subsistence Economy and Labrador Inuit Culture Change.* 1997–1999. Hunter College, City University of New York.

McGovern, Thomas H., and Thomas Amorosi.

Historical Dimensions of Sustainability in the North Atlantic ca. 2,000 BP–Present. 1996–2000. Hunter College, City University of New York.

North Atlantic Biocultural Coordination and Research Project. 1993–1998. Hunter College, City University of New York.

McGovern, Thomas H., Thomas Amorosi, and William J. Parry. *Northern Archaeological Research Training.* 1991–1995. Hunter College, City University of New York.

McNabb, Steven, Alexandra Pika, and William W. Richards. *Comparative Study of Social Transition in the North: Alaska and Russian Far East.* 1992–1996. University of Washington and Social Research Institute.

Metcalfe, Duncan. *Doctoral Dissertation Research: Mitochondrial DNA Sequence Variation Ancient Eastern North American Arctic Peoples.* 1998–2000. University of Utah.

Morrow, Phyllis, Galen Paine, and Betty Harnum. *Justice and Discourse: Relationships Between Communicative Strategies and Trial Outcomes in Southwest Alaska.* 1991–1993. University of Alaska Fairbanks.

Nabokov, Peter. *Doctoral Dissertation Research: Diseased Lands: Inupiat Narratives on Cancer and Social Change.* 1995–1996. University of Wisconsin Madison.

Netting, Robert M. *et al. Critical Analysis of Historical Data Relating to Climate Change.* 1992–1993. University of Arizona.

Picou, J. Steven, and Christopher L. Dyer. *Long-Term Social Impact of the Exxon Valdez Oil Spill on Natural Resource-Dependent Communities in Prince William Sound.* 1991–1994. University of Southern Alabama.

Powers, Roger W., and Frank (Ted) E. Goebel. *Archaeological Perspectives on the Origins of the Siberian Late Paleolithic.* 1991–1993. University of Alaska Fairbanks.

Rappaport, Roy A. *Tourism and Sustainable Development in the Arctic: An Anthropological Analysis of Indigenous Development of Tourism in a Greenlandic Community.* 1995–1996. University of Michigan.

Reanier, Richard E., and E. S. Hall. *Late Prehistoric and Ipiutak Settlements in the Brooks Range.* 1994–1999. State University of New York at Brockport.

Rosenberg, Jonathan. *Comparative Ecosystem Management and Local Participation.* 1998–1999. University of Alaska Fairbanks.

Sadock, Jerrold M. *A Grammar of West Greenlandic.* 1992–1993. University of Chicago.

Sambo, Dalee. *Establishment of an International Working Group on Fetal Alcohol Syndrome.* 1993–1994. International Union for Circumpolar Health.

Schneider, William, and Paul Ongtooguk. *Preservation and Access to Alaska Native Recordings.* 1993–1995. University of Alaska Fairbanks.

Schoeninger, Margaret J. *Eskimos and Maize Agriculturalists: Interpreting Patterns of Cortical Bone Remodeling in Human Skeletal Populations Using an Animal Model.* 1993–1995. University of Wisconsin Madison.

Schweitzer, Peter P. *Creole Communities in Northeastern Siberia: An Ethnographic Study of Ethnic Identity, Social Status, and Political Power.* 1998–2001. University of Alaska Fairbanks.

Schweitzer, Peter P., Patty Gray, and James J. Simon. *Regional Problems and Local Solutions in the Post-Soviet Transition: An Ethnographic Study of Reindeer Herding Communities in the Chukotka Autonomous Okrug.* 1998. University of Alaska Fairbanks.

Seyfrit, Carole L.

Rapid Social Change and Attitudes, Expectations, and Aspirations of Arctic Youth. 1991–1994. Mississippi State University and Old Dominion Research Foundation.

Occupational, Educational and Residential Choices of Arctic Youth: Longitudinal Comparison of High School Aspirations and Young Adult Behaviors. 1994–1999. Old Dominion Research Foundation.

Sheehan, Glenn W., Anne M. Jensen, and Gregory A. Reinhardt. *Archaeology of the North Alaska Coast: A Settlement Pattern Study from Point Franklin to Wainwright.* 1994–1998. Bryn Mawr College.

Sonnenfeld, Joseph. *Travel Behaviors in an Extreme Environment: Changing Technologies, Skills, and Risks Among the Inupiat of Northern Alaska.* 1991–1994. Texas A&M University Research Foundation.

Speth, John D., and Benjamin J. Fitzhugh. *Prehistoric Settlement and Land Use and the Development of Complex Social Systems in the North Pacific: A Case Study from Kodiak Island, Alaska.* 1993–1996. University of Michigan.

Sprott, Julie E., and Rachel Craig. *Inupiat Eskimo Childrearing: Impact of Adult Relatives.* 1993–1998. Northwest Arctic Borough.

Stoltman, James B. *Dissertation Research: Is Salmon Specialization Concurrent with Changing Village Organization in the Kodiak Archipelago?* 1996–1998. University of Wisconsin Madison.

Swibold, Susanne M., Nina A. Kiyaikina, and Helen D. Corbett. *The Commandor Islands Research Project.* 1998–1999. AMIQ Institution.

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Vasey, Daniel E. *Iceland Database Project Two.* 1993–1995. Divine Word College.

Verdery, Katherine. *Dissertation Improvement Grant: Home Watching TV: Traditional Knowledge and Social Change in the Kluane Region of Canada's Yukon Territory.* 1997. Johns Hopkins University.

West, Dixie. *Western Aleutians Archaeological Paleobiological Project.* 1997–2001. University of Kansas Main Campus.

Wilk, Richard. *An Archaeological Resource Dilemma in Perspective: Values and Practices on St. Lawrence Island.* 1996–1998. Indiana University Bloomington.

Williams, Stephen. *Inuit/Euro-American Interaction: A Zooarchaeological Perspective from Frobisher Bay, N.W.T., Canada.* 1992–1994. Harvard University.

Williams, Stephen, and Paula Molloy. *Doctoral Dissertation Research in Geography and Regional Science.* 1992–1994. Harvard University.

Wilson, Leonard A., Jim Powell, Tom Gallagher, and M. V. Rajeev Gowda. *A Conference to Explore Substantive and Methodological Issues Surrounding the Cross-Cultural Assessment of Environmental Risk.* 1994–1995. University of Alaska Southeast.

Young, Oran R.

The Elders Conference: History and Practice of Eastern Arctic Archaeology. 1993. Dartmouth College.

Envisioning International Regimes: The Politics of Prenegotiation in the Arctic. 1994–1997. Dartmouth College.

Future Directions in Arctic Research. 1992–1994. Dartmouth College.

Young, Oran R., and Alan R. Marcus. *An Investigation of Canada's Inuit Resettlement Programs.* 1991–1993. Dartmouth College.

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Principles for the Conduct of Research in the Arctic

The Principles for the Conduct of Research in the Arctic, *included here in total, were prepared by the Social Science Task Force of the U.S. Interagency Arctic Research Policy Committee (IARPC) and approved by IARPC on June 28, 1990. These principles are to be observed when carrying out or sponsoring research in Arctic and northern regions or when applying the results of this research.*

Introduction

All researchers working in the North have an ethical responsibility toward the people of the North, their cultures, and the environment. The following principles have been formulated to provide guidance for researchers in the physical, biological, behavioral, health, economic, political, and social sciences and in the humanities. These principles are to be observed when carrying out or sponsoring research in Arctic and northern regions or when applying the results of this research. This statement addresses the need to promote mutual respect and communication between scientists and northern residents. Cooperation is needed at all stages of research planning and implementation in projects that directly affect northern people. Cooperation will contribute to a better understanding of the potential benefits of Arctic research for northern residents and will contribute to the development of northern science through traditional knowledge and experience. These *Principles for the Conduct of Research in the Arctic* were prepared by the Interagency Social Science Task Force in response to a recommendation by the Polar Research Board of the National Academy of Sciences and at the direction

of the Interagency Arctic Research Policy Committee. This statement is not intended to replace other existing Federal, State, or professional guidelines, but rather to emphasize their relevance for the whole scientific community. Examples of similar guidelines used by professional organizations and agencies in the United States and in other countries are listed in the publications (see page 70).

Implementation

All scientific investigations in the Arctic should be assessed in terms of potential human impact and interest. Social science research, particularly studies of human subjects, requires special consideration, as do studies of resources of economic, cultural, and social value to Native people. In all instances, it is the responsibility of the principal investigator on each project to implement the following recommendations:

1. The researcher should inform appropriate community authorities of planned research on lands, waters, or territories used or occupied by them. Research directly involving northern people or communities should not proceed without their clear and informed consent. When informing the community and/or obtaining informed consent, the researcher should identify:
   a. all sponsors and sources of financial support;
   b. the person in charge and all investigators involved in the research, as well as any anticipated need for consultants, guides, or interpreters;
   c. the purposes, goals, and time frame of the research;
   d. data-gathering techniques (tape and video recordings, photographs, physiological measurements, and so on) and the uses to which they will be put; and
   e. foreseeable positive and negative implications and impacts of the research.
2. The duty of researchers to inform communities continues after approval has been obtained. Ongoing projects should be explained in terms understandable to the local community.
3. Researchers should consult with and, where applicable, include northern communities in project planning and implementation. Reasonable

opportunities should be provided for the communities to express their interests and to participate in the research.

4. Research results should be explained in nontechnical terms and, where feasible, should be communicated by means of study materials that can be used by local teachers or displays that can be shown in local community centers or museums.

5. Copies of research reports, data descriptions, and other relevant materials should be provided to the local community. Special efforts must be made to communicate results that are responsive to local concerns.

6. Subject to the requirements for anonymity, publications should always refer to the informed consent of participants and give credit to those contributing to the research project.

7. The researcher must respect local cultural traditions, languages, and values. The researcher should, where practicable, incorporate the following elements in the research design:

   a. Use of local and traditional knowledge and experience.

   b. Use of the languages of the local people.

   c. Translation of research results, particularly those of local concern, into the languages of the people affected by the research.

8. When possible, research projects should anticipate and provide meaningful experience and training for young people.

9. In cases where individuals or groups provide information of a confidential nature, their anonymity must be guaranteed in both the original use of data and in its deposition for future use.

10. Research on humans should only be undertaken in a manner that respects their privacy and dignity:

    a. Research subjects must remain anonymous unless they have agreed to be identified. If anonymity cannot be guaranteed, the subjects must be informed of the possible consequences of becoming involved in the research.

b. In cases where individuals or groups provide information of a confidential or personal nature, this confidentiality must be guaranteed in both the original use of data and in its deposition for future use.

c. The rights of children must be respected. All research involving children must be fully justified in terms of goals and objectives and never undertaken without the consent of the children and their parents or legal guardians.

d. Participation of subjects, including the use of photography in research, should always be based on informed consent.

e. The use and disposition of human tissue samples should always be based on the informed consent of the subjects or next of kin.

11. The researcher is accountable for all project decisions that affect the community, including decisions made by subordinates.

12. All relevant Federal, State, and local regulations and policies pertaining to cultural, environmental, and health protection must be strictly observed.

13. Sacred sites, cultural materials, and cultural property cannot be disturbed or removed without community and/or individual consent and in accordance with Federal and State laws and regulations.

In implementing these principles, researchers may find additional guidance in the publications listed below. In addition, a number of Alaska Native and municipal organizations can be contacted for general information, obtaining informed consent, and matters relating to research proposals and coordination with Native and local interests. A separate list is available from NSF's Office of Polar Programs.

Publications

Arctic Social Science: An Agenda for Action. National Academy of Sciences, Washington, DC. 1989.

Draft Principles for an Arctic Policy. Inuit Circumpolar Conference, Kotzebue, AK. 1986.

Ethics. Social Sciences and Humanities Research Council of Canada, Ottawa. 1977.

Nordic Statement of Principles and Priorities in Arctic Research. Center for Arctic Cultural Research, Umeå, Sweden. 1989.

Policy on Research Ethics. Alaska Department of Fish and Game, Juneau, AK. 1984.

Principles of Professional Responsibility. Council of the American Anthropological Association, Washington, DC. 1971, rev. 1989.

The Ethical Principles for the Conduct of Research in the North. The Association of Canadian Universities for Northern Studies, Ottawa. 1982.

The National Arctic Health Science Policy. American Public Health Association, Washington, DC. 1984.

Protocol for Centers for Disease Control/Indian Health Service Serum Bank. Prepared by Arctic Investigations Program (CDC) and Alaska Area Native Health Service. 1990. (Available through Alaska Area Native Health Service, 255 Gambell Street, Anchorage, AK 99501.)

Indian Health Manual. Indian Health Service, U.S. Public Health Service, Rockville, MD. 1987.

Human Experimentation. Code of Ethics of the World Medical Association (Declaration of Helsinki). Published in *British Medical Journal 2*(177). 1964.

Protection of Human Subjects. Code of Federal Regulations 45 CFR 46. 1974, rev. 1983.

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Arctic Research Program Opportunities, NSF 98-72

This announcement may change over time. This is the most current at the time of this publication. See the NSF web site or contacts below for updates.

Program Announcement

Office of Polar Programs, National Science Foundation

Annual Target Dates: February 15 and August 1

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants for research and education in the sciences, mathematics and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF web site at http://www.nsf.gov.

- Location: 4201 Wilson Blvd., Arlington, VA 22230
- For General Information (NSF Information Center): (703) 306-1234
- TDD (for the hearing-impaired): (703) 306-0090
- To Order Publications or Forms: Send an e-mail to: pubs@nsf.gov or telephone: (301) 947-2722
- To Locate NSF Employees: (703) 306-1234

Introduction

The National Science Foundation (NSF) invites U.S. scientists to submit proposals for research in all of the Arctic and to perform arctic research based at institutions in the United States.

7 Arctic Research Program Opportunities, NSF 98-72

The goal of the NSF Arctic Research Program is to gain a better understanding of the Earth's biological, geological, chemical, and socio-cultural processes, and the interactions of ocean, land, atmosphere, biological, and human systems. Arctic research is supported at NSF by the Office of Polar Programs (OPP) (http://www.nsf.gov/od/opp/), as well as by a number of other disciplinary programs within the Foundation that are linked through an internal NSF Arctic Affiliates system. This system, consisting of program representatives from other NSF programs that support arctic research, provides coordination across NSF, including a structure that enables joint review and funding of arctic proposals, as well as mutual support of special projects with high logistical costs.

OPP offers focused multidisciplinary and interdisciplinary programs that emphasize the uniqueness of the Arctic for special scientific studies. Models indicate that the arctic regions are among the most sensitive to environmental change. They have a long natural climate record and thousands of years of human settlement. This interplay provides a unique basis for integrated research on global systems and human adaptation.

OPP disciplinary interests encompass the atmospheric, biological, earth, ocean, and social sciences. Interdisciplinary research in the biosciences, geosciences, and social sciences is linked in the Arctic System Science Program. In addition to supporting research on long-term human-environment interactions, OPP encourages the study of contemporary socio-economic, cultural, and demographic issues in the changing political environment of the post-Cold War world. The OPP also encourages bipolar research, especially glaciology, permafrost, sea ice, ecology, and aeronomy. Increasing emphasis is being given to the integration of research and education. Scientific programs connected to students (K–12 and above), affected communities in the north, and the general public's improved understanding of basic research are strongly encouraged. Educational components are encouraged with proposed research in all disciplines and programs, but stand-alone proposals will also be entertained.

The United States Arctic Research and Policy Act of 1984 defines the Arctic as all areas north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas, and the Aleutian chain. Field projects falling outside these boundaries but directly related to arctic science and engineering conditions or issues, such as laboratory and theoretical studies, are appropriate.

The Foundation is one of twelve Federal agencies that sponsor or conduct arctic science, engineering, and related activities. As mandated by the Arctic

Research and Policy Act of 1984. Federal interagency research planning is coordinated through the Interagency Arctic Research Policy Committee (IARPC) which is chaired by NSF.

Under an agreement with the U.S. Navy, access to a nuclear submarine is available annually for research in the Arctic Ocean. Researchers are strongly encouraged to pursue this possibility with OPP or directly with Office of Naval Research (ONR). Further information on other agency programs is presented in the journal *Arctic Research of the United States* (NSF 96-130), and the *U.S. Arctic Research Plan* and its biennial revisions (NSF 97-148).

As the Arctic is the homeland of numerous Native peoples, special attention must be given to all aspects of research and education that may potentially impact their lives. An interagency statement of "Principles for the Conduct of Research in the Arctic" has been developed and all arctic research grantees are expected to abide by these guidelines (see page 55).

In fiscal year 1997, NSF supported 362 Arctic research projects for a total of $49.39 million. Of this, $30.71 million was from the OPP Arctic Research Program.

A compilation of all NSF arctic and related research grants for each fiscal year is available (NSF 97-78 or http://www.nsf.gov/cgi-bin/getpub?nsf98101 for FY 1997). The current NSF Guide to Programs (NSF 97-150 or http://www.nsf.gov/cgi-bin/getpub?gp) should be consulted for additional program information.

RESEARCH PROGRAMS

Listed below are the principal OPP programs that support arctic research. There are three integrated programs in OPP: Arctic Natural Sciences, Arctic Social Sciences, and Arctic System Science. Support is also provided for data and information management research activities. These programs and their components are described below.

Arctic Natural Sciences Program

The OPP Arctic Natural Sciences Program supports research in glaciology and in the atmospheric, biological, earth, and ocean sciences. This program provides core support for disciplinary research in the Arctic and coordinates its support of arctic research with the Directorates for Geosciences and Biological Sciences. Areas of special interest include: marine and terrestrial ecosystems, atmospheric chemistry, exploration of the Arctic Ocean, as well as Arctic geological and glaciological processes.

Atmospheric Sciences

Research in arctic atmospheric sciences focuses on stratospheric and tropospheric processes as well as arctic climate and meteorology. Research on past climates and atmospheric gases as preserved in snow and ice cores have also been supported as has research on atmosphere-sea and atmosphere-ice interactions.

In upper atmospheric and space physics, research interests include auroral studies, atmospheric dynamics and chemistry as well as magnetosphere-ionosphere coupling. Conjugate studies are considered jointly with the Antarctic Aeronomy and Astrophysics Program.

Biological Sciences

OPP supports projects that emphasize understanding of the adaptation of organisms to the arctic environment. Biological studies in the Arctic include: research in freshwater, marine, and terrestrial biology; organismal adaptation to the arctic environment; ecology; ecosystem structure and processes; and the biological consequences of ultraviolet radiation. OPP also participates in the Life in Extreme Environments (LExEN) initiative (NSF announcement 97-157).

Earth Sciences

Research supported by OPP includes all subdisciplines of terrestrial and marine geology and geophysics. Special emphasis is placed on understanding geological processes important to the arctic regions and geologic history dominated by those processes.

Glaciology

The OPP is the focal point for glaciological research within the Foundation. Glaciological research is concerned with the history and dynamics of all naturally occurring forms of snow and ice, including seasonal snow, glaciers, and the Greenland ice sheet. The Arctic Natural Sciences Program also includes ice dynamics, modeling, glacial geology, and remote sensing studies of ice sheets.

Ocean Sciences

The goal of oceanographic research in the Arctic is to develop knowledge of the structure of the Arctic Ocean and adjacent seas, their physical and biological interactions with the global hydrosphere, and the formation and persistence of the arctic sea-ice cover. Areas of special interest are: the distribution of life in high latitude oceans; low temperature life processes; the formation, movement, and

mixing of arctic water masses; the growth and decay of sea ice; the exchange of salt and heat with the Atlantic Ocean and the Bering Sea; geographical anomalies; sedimentary history and the role of the Arctic Ocean and adjacent seas in global climate. Proposals concerned with the interdependencies of chemical and physical processes and marine organisms and productivity are encouraged.

Arctic Social Sciences Program

The OPP Arctic Social Sciences Program encompasses all social sciences supported by NSF. These include anthropology, archaeology, economics, geography, linguistics, political science, psychology, sociology, and related subjects.

Although unsolicited proposals in any of the social sciences mentioned above are welcome, areas of particular interest include: rapid social change (including the processes and consequences of social, economic, and cultural change), community viability (including issues related to community and/or cultural vitality and survival), and human/environment interactions (including issues related to subsistence and sustainable development).

The Arctic Social Sciences Program especially encourages projects that: include indigenous peoples; are circumpolar and/or comparative; integrate social and natural sciences; involve collaborations between researchers and those living in the Arctic; include traditional knowledge; or form connections among disciplines, regions, researchers, communities, and/or students (K-12, undergraduate, or graduate).

Projects involving research with human subjects must ensure that subjects are protected from research risks in conformance with the Common Rule (Federal Policy for the Protection of Human Subjects, 45 CFR §690). Before issuance of an NSF award, all projects involving human subjects must either have approval from the organization's Institutional Review Board (IRB) or identify the applicable subsection exempting the proposal from IRB review, as established in section 101(b) of the Common Rule. Submission of the IRB approval form or indication of exemption should be included in Section I of the proposal (see Grant Proposal Guide NSF 98-2). Section I should also include letters describing any other permission or approval, such as from Native organizations or communities in which the work will take place.

The Arctic Social Sciences Program considers joint review and funding with other NSF and OPP programs, when appropriate. Special funding opportunities may also be available through NSF's Environment and Global Change activities (see "Crosscutting Areas of Research and Education" in *Guide to Programs* (NSF 97-150) or the Arctic System Science (ARCSS) Program (refer below).

Arctic System Science (ARCSS) Program

The ARCSS Program supports interdisciplinary research, whose goal is to 1) understand the physical, geological, chemical, biological and sociocultural processes of the arctic system that interact with the total Earth system and thus contribute to or are influenced by global change, in order to 2) advance the scientific basis for predicting environmental change on a seasonal-to-centuries time scale, and for formulating policy options in response to the anticipated impacts of global change on humans and societal support systems. In order to achieve the goals of ARCSS an emphasis is placed on four scientific thrusts: understanding global and regional impacts of the arctic climate system and its variability; determining the role of the Arctic in global biogeochemical cycling; identifying global change impacts on the structure and stability of arctic ecosystems; and establishing the links between environmental change and human activity.

ARCSS directs most available support to large integrated research projects that are proposed and implemented in response to science plans developed by the scientific community through Science Steering Committees (SSCs) for each component of ARCSS. However, global change proposals from individual investigators or small groups of investigators are also welcome.

ARCSS has three linked components for which proposals are encouraged: 1) Ocean/Atmosphere/Ice Interactions (OAII); 2) Land/Atmosphere/Ice Interactions (LAII); and 3) Paleoenvironmental Studies. The third component has had two projects: Paleoclimates from Arctic Lakes and Estuaries (PALE) and Greenland Ice Sheet Program Two (GISP2). Paleoenvironmental proposals are now considered within the Earth System History initiative of the United States Global Change Research Program (NSF 97-161). ARCSS further develops a fourth component: Human Dimensions of the Arctic System (HARC). The HARC science plan is accessible through the World Wide Web home page of the Arctic Research Consortium of the U.S. (ARCUS), http://www.arcus.org, and the NSF Web Page should be consulted for new developments. In all these components proposals for new and different research topics are encouraged.

ARCSS also supports the integration of research results across components within ARCSS as well as with any other Arctic research program through a Synthesis, Integration and Modeling Studies (SIMS) effort. Science plans approved by each SSC and examples of projects supported within each component and SIMS are accessible either on the World Wide Web site maintained by the ARCSS Data Coordination Center of the University of Colorado National Snow and Ice Data Center, http://arcss.colorado.edu/ or the ARCUS home page.

Successful proposals have been funded by the Office of Polar Programs, the Divisions of Atmospheric Sciences and Ocean Sciences within the Directorate for Geosciences, by the Division of Environmental Biology, Directorate for Biological Sciences and, in some cases jointly with ONR, NASA, and DOE.

The Arctic system consists of physical, biological, and cultural factors that may respond to global change. Some models that predict the climatic response to global change show greater change in the Arctic than any other region. The predicted climatology, however, may not consider the largely unknown interannual variability in the Arctic. The presence of cultural institutions in a region subject to possibly large perturbations, however, makes it important that scientists better understand interactions of the global and Arctic systems. Therefore, the research supported in ARCSS extends beyond purely observational studies to those studies that predict and analyze the consequences of global change important to wise stewardship of renewable resources and development of policy options for resource managers and residents.

In order to focus on the Arctic system at a scale that incorporates the multiple environmental feedback mechanisms involved, large interdisciplinary projects that integrate major elements of the system will be supported.

For more information on how a research proposal might best fit the programs and themes of ARCSS, contact the program manager.

OTHER ARCTIC SUPPORT

Arctic Research and Policy

OPP supports the management of arctic data and information, including development of the Arctic Environmental Data Directory (AEDD). The Arctic Environmental Data Directory (AEDD) is accessible on the World Wide Web (http://www-ak.wr.usgs.gov/aedd/history.html), and contains information on several hundred arctic data sets. The objective of this type of support is to make arctic data and information more readily available to researchers. Proposals to integrate data and information management are especially encouraged.

Arctic Logistics

An arctic logistics budget component has been established in the OPP to address field program requirements beyond those commonly included in proposals from an individual or small group of investigators. Examples of the type of logistic and research support that may be provided through the separate logistics component dependent on the site, include: ski-equipped heavy-lift aircraft, research

vessels, multi-investigator helicopter or aircraft use, large remote field camps, day-use fees at major Arctic research sites where NSF has established a support structure (currently, Toolik Field Station, Barrow, and Prudhoe Bay/Deadhorse, AK, Kangerlussuaq and Thule, Greenland), and special transportation needs required for arctic research or available at the sites listed above.

There are two types of logistics support: Type 1) routine requirements typically included in proposals from an individual or small group are dealt with by the P.I., and included in the cost budget, and Type 2) coordinated requirements such as those listed above and supplied by an OPP contractor or cooperating agency are arranged in cooperation with the NSF program manager; these costs are not included in the individual investigator's proposal budget. All investigators proposing research projects that may require such support are encouraged to contact the appropriate program manager or the NSF Arctic Logistics Coordination Specialist to determine if they are eligible for Type 1 or Type 2 logistics support. Type 2 support will require completion of the Logistics Coordination Form. A copy is available as a PDF file on the NSF Web site at http://www.nsf.gov/pubs/1998/nsf9872/appen2.pdf.

There are special requirements for field work in Greenland. Principal investigators contemplating work in Greenland should obtain the Danish Polar Center application form for research in Greenland. It is available on the World Wide Web at http://www.dpc.dk/Forms/ResProjectForm.html. A copy of the application should be included with the proposal submitted to OPP.

Special Programs

The Guide to Programs (NSF 97-150) provides guidance regarding special funding opportunities including international cooperative activities, human resources development and other programs. Described below are some of these opportunities that are supported by the OPP Arctic Program. For details about these programs and other programs refer to the Guide to Programs; the NSF Home Page (http://www.nsf.gov), or the NSF publications noted below.

Small Grants for Exploratory Research (SGERs)

These awards are intended to provide support for small scale exploratory, high-risk research involving preliminary work on untested ideas, ventures into emerging areas, or research having severe urgency etc. Proposers are strongly encouraged to contact the cognizant program officer before submission.

Small Business Innovation Research Program (SBIRs)

The Small Business Innovation Research Program (NSF 97-64) primarily facilitates research on advanced concepts in scientific or engineering areas, particularly where the research may serve as a base for technological innovation. Polar topics of interest include cold-weather design, remotely operated and autonomous vehicles and sensors, geophysical and space technologies, biotechnology, and long-term operations and construction. Technical projects relating to rural communities, including sanitation, water purification, heating, clothing and construction, as well as culturally relevant educational curriculum products are considered.

Education and Human Resource Development Opportunities

The Arctic Research Program of the OPP is committed to educational and human resource development. Many opportunities exist, primarily through programs in or joint funding with the Education and Human Resources Directorate (EHR). Information about specific programs may be found in the Guide to Programs (NSF 97-150), the NSF Home Page (http://www.nsf.gov), as well as the Elementary, Secondary, and Informal Education (ESIE) Program Announcement (NSF 97-20) and the Undergraduate Education (DUE) Program Announcement (NSF 97-29). Some of the grant and supplement programs supported by the Arctic Research Program are listed below.

Research Grant Programs

Knowledge and Distributed Intelligence (KDI)

KDI is a Foundation-wide effort designed to catalyze the growth in computer power, connectivity, content, and flexibility that is so fundamental that it is dramatically reshaping relationships among people and organizations, and quickly transforming our processes of discovery, learning, exploration, cooperation, and communication. Deadline for KDI submissions is April 1 for Letter of Intent and May 8 for full proposal submission (for details see the KDI Home Page, http://www.nsf.gov/kdi).

Life and Earth's Environment (LEE)

LEE is a broad theme describing activities that focus on interdependencies among living organisms and their environment. Emphases may change from year to year, but for FY 99 they include:

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- LExEN, (NSF 97-157 or http://www.nsf.gov/pubs/1997/nsf97157/nsf97157.txt) interdisciplinary research program that explores the relationships between microorganisms and the environments within which they exist, with a strong emphasis upon those life-supporting environments that exist near the extremes of planetary conditions. In addition, the Life In Extreme Environments program will explore planetary environments in our own solar system and beyond to help identify possible sites for life elsewhere.
- Environmental Observatories
- Global Change
- Engineered Systems
- Urban Communities
- Integrated Research Challenges

Doctoral Dissertation Research

Dissertation grants are available in all OPP disciplines as part of the OPP Arctic Research Program. This support covers travel, fieldwork expenses, data management and other costs connected with doctoral research projects. Proposals are limited to 10 pages and are submitted by the dissertation advisor with the student as co-investigator (Co-PI). Contact the relevant program officer for more information.

Research Experience for Undergraduates Sites (REUs)

REU Site Awards provide opportunities for undergraduate students to participate in research projects that support at least six students. The annual submission deadline for the REU Sites Program is September 15.

Faculty Early Career Development Program (CAREER)

This program (NSF 97-91) is a Foundation-wide activity that supports junior faculty within the context of overall faculty development. It supports combined research and education activities. Deadline for CAREER submissions is July 22 (for details see the NSF Home Page, http://www.nsf.gov under "cross-cutting programs").

Increasing Participation of Underrepresented Populations

NSF supports a number of activities directed at attracting students to science and engineering from underrepresented groups and increasing the numbers of

women (e.g., Professional Opportunities for Women in Research and Education, NSF 97-91), and persons with disabilities (NSF 91-54 and NSF 97-85) who are full participants in the mainstream of the Nation's research activities.

Supplements to Existing OPP Grants

Research Experiences for Undergraduates (REU) supplements to existing grants in support of one or two undergraduate students in ongoing research can be requested at any time. Contact the relevant OPP program officer for more information.

Informal Science Education (ISE) Supplements for Public Understanding of Research. These supplements (of up to $50,000 to existing NSF research grants) are intended to inform the general public about the content, process, and relevance of state-of-the-art research (see NSF 97-70). Interested PIs with active research grants should contact their program officer for information about requirements for these supplements and procedures for applying.

High School Teacher/Student Arctic Research Experience. In conjunction with the Education and Human Resources Directorate (EHR) researchers with ongoing Arctic projects can volunteer to host a high school teacher/student pair and include them in a research program. Funding is in the form of supplements made to existing grants.

World Wide Web Supplements. Small supplements designed to fund the dissemination of Arctic research results to a general audience through the World Wide Web may be available for existing grants. Contact the relevant OPP program officer.

How To Prepare Proposals

Before writing a proposal send for a copy of the Foundation's booklet, Grant Proposal Guide (NSF 98-2), or consult the NSF Web page (http://www.nsf.gov). This booklet gives the format for proposals, lists the budget items that may be supported, explains the proposal evaluation process, and summarizes responsibilities of the grant recipient. Copies of the GPG or the NSF Proposal Forms Kit (NSF 98-3) may be ordered from:

NSF Clearinghouse
PO Box 218
Jessup, MD 20794-0218
Telephone: 301-947-2722
e-mail: pubs@nsf.gov

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Contact a program manager in your scientific discipline if you have further questions, especially concerning specific annual program opportunities or consult the NSF Home Page (http://www.nsf.gov) for new announcements of research opportunities.

Who May Submit

The National Science Foundation supports researchers affiliated with U.S. universities, research institutions or other organizations, including local or State governments. All applications must be submitted by the sponsoring institution. In accordance with Federal statutes and regulations and NSF policies, no person on grounds of race, color, age, gender, national origin or disability shall be excluded from receiving assistance from the National Science Foundation. The Foundation strongly encourages women, minorities and persons with disabilities to submit proposals to all programs. Arctic research that addresses Native concerns and involves Native collaboration and training is particularly encouraged.

OPP Target Dates and Proposal Submission

In 1998 the OPP Arctic program will have two target dates for submission of proposals: April 1 and August 1. In subsequent calendar years the target dates will be February 15 and August 1. Proposals for workshops, exploratory research (SGER) or dissertation improvement grants can be submitted at any time.

Proposals for field programs requiring research support in the categories listed on the Logistics Coordination Form must be submitted with sufficient lead time to ensure scheduling and availability (a copy is available as a PDF file on the NSF Web site at http://www.nsf.gov/pubs/1998/nsf9872/appen2.pdf). Proposals requesting those logistics capabilities must be submitted no later than the February 15 (April 1 in 1998) target date of the calendar year preceding that in which the research will be conducted. Proposals requiring an oceanographic research vessel must be submitted to either the Division of Ocean Sciences by February 15 of the year preceding the proposed cruise dates or to the OPP Arctic Program by the February 15 (April 1 in 1998) target date to allow 9 months pre-cruise notification. A minimum 9 month advance notification is required for research vessel clearances for Russian waters. Proposals for field work not requiring research support capabilities listed on the Logistics Coordination Form must be submitted no later than the August 1 target date of the preceding year.

For More Information

For further information about activities mentioned in this announcement, contact the corresponding office listed below, or visit the OPP Home Page (http://www.nsf.gov/od/opp) on the World Wide Web.

The Office of Polar Programs—(703) 306-1030
Arctic Sciences Section—(703) 306-1029
Antarctic Sciences Section—(703) 306-1033

Other Support

Other NSF programs supporting arctic research have varied deadlines or target dates. Contact specific programs for these dates and refer to the NSF Bulletin for announcements of program deadlines and target dates. The NSF Bulletin and other publications are available through e-mail.

Proposal Submission

For hard copy submissions, the original and 20 copies must be received by the target dates. Proposals must be mailed and addressed as follows:

Announcement No_____ or NSF Program_____.
National Science Foundation PPU, Room P60
4201 Wilson Blvd
Arlington VA 22230.

Proposals should be prepared in accordance with instructions in the brochure, Grant Proposal Guide (NSF 98-2). This brochure includes application forms which may be photocopied. It can be obtained from your institution's research office or from the NSF Forms and Publications Office, (703) 306-1130. Proposals may also be submitted electronically using the NSF FastLane system for electronic proposal submission and review, available through the World Wide Web at the FastLane home page (http://www.fastlane.nsf.gov). In order to use NSF FastLane to prepare and submit a proposal you must use a browser that supports multiple buttons and file upload (e.g., Netscape 2.0 and above for Windows, UNIX, or Macintosh). In addition, Adobe Acrobat Reader is needed to view and print forms, and Adobe Acrobat 3.0 (or Adobe Exchange or Distiller) is needed for creating PDF files. To access the FastLane Proposal Preparation application, your institution needs to be a registered FastLane institution. A list of registered institutions and the FastLane registration form are located on the FastLane home page.

Collaborative proposals can be submitted by two or more institutions. These proposals should all be identical, and should contain copies of all budgets, biographical sketches, other support statements, prior support, and of all cover sheets. Each institution should submit its own set. Twenty copies of the lead institution proposal, and five copies of the other institution(s) proposals are needed.

MERIT REVIEW PROCESS

Proposals submitted in response to this program announcement will be subject to the new merit review criteria approved by the National Science Board on March 28, 1997 (NSB 97-72 or http://www.nsf.gov/pubs/1997/nsbmr975/nsbmr975.htm). The new merit review criteria are:

What is the intellectual merit and quality of the proposed activity?

The following are suggested questions that the reviewer will consider in assessing how well the proposal meets this criterion. Each reviewer will address only those questions which he/she considers relevant to the proposal and for which he/she is qualified to make judgments.

How important is the proposed activity to advancing knowledge and understanding within its own field and across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

The following are suggested questions that the reviewer will consider in assessing how well the proposal meets this criterion. Each reviewer will address only those questions which he/she considers relevant to the proposal and for which he/she is qualified to make judgments.

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

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